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PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical
and ecological publication

Vol. 67

November 1989

No.5

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A NEW COMBINATION IN *CHORIZANTHE ROBUSTA* C. PARRY
(POLYGONACEAE: ERIOGONOIDEAE) FROM CALIFORNIA

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BOTANICAL GARDEN

ABSTRACT

A new combination, *Chorizanthe robusta* var. *hartwegii*, based on *C. douglasii* var. *hartwegii* Benth. in DC., is proposed. The plant is a highly restricted endemic known only from three populations near Scotts Valley in the Santa Cruz Mountains of Santa Cruz Co., California, where it is found only on bare patches of exposed bedrock in isolated annual grasslands. It differs from the var. *robusta* in its consistently erect habit and rose-pink rather than white involucre lobes.

KEY WORDS: Polygonaceae, taxonomy, *Chorizanthe*, California.

INTRODUCTION

In a recent revision of the annual species of *Chorizanthe* (Polygonaceae: Eriogonoideae), Reveal and Hardham (1989) showed that the pink-involucre expression from the Santa Cruz Mountains termed *C. pungens* Benth. var. *hartwegii* (Benth. in A. DC.) Goodman in the more recent monographic and floristic literature was undescribed. They named the plant *C. pungens* var. *hartwegiana* Rev. & Hardham. As for the var. *hartwegii*, they considered it to be an erect, rose-pink-involucre expression of *C. robusta* C. Parry, an otherwise white-involucre plant of coastal or near coastal central California.

In an effort to discern the significance of var. *hartwegii*, the senior author attempted, but failed, to relocate the plant. Without adequate material, no differentiation was proposed and var. *hartwegii* was placed in synonymy. However, even as the revision was being published, the junior author of the present paper was studying the long-lost plant in the field and recognizing its distinctiveness from *C. robusta*.

An examination of the new material proved the taxon occurred in "dry mountain pastures" as stated by Hartweg, and confirmed the just proposed suggestion that the plant indeed belonged to the *Chorizanthe robusta* complex rather than to *C. pungens*. The new observations also provided evidence that the unusual involucre color and the erect habit are consistent features.

Preliminary transplant studies seem to indicate that the degree of pink colorization of the involucre lobes is related to light intensity. All plants in the wild occur only in full sun and consistently have rose-pink involucres. This coloring is more intense than that of the pink-flowered *C. pungens* var. *hartwegiana* which occurs in great abundance on sand deposits to the west, and is comparable to that of *C. douglasii* to the south in Monterey County. By contrast, involucres of the var. *robusta* are white, regardless of light intensity.

TAXONOMY

Chorizanthe robusta C. Parry var. ***hartwegii*** (Benth. in A. DC.) Reveal & Morgan, comb. nov., based on *C. douglasii* Benth. var. *hartwegii* Benth. in DC., Prodr. 14: 26. 1856. — TYPE: dry mountain pastures near Santa Cruz, Santa Cruz Co., California, 1847, Hartweg 1935 (holotype: K!; isotypes: BM, BR, CGE, G, GH, K, MO, OXF!). — *Chorizanthe pungens* Benth. in A. DC. var. *hartwegii* (Benth. in A. DC.) Goodman, Ann. Missouri Bot. Gard. 21: 37. 1934.

Erect villous annual herbs (0.5) 1-3 dm high and (0.1) 1-2.5 dm across; leaves mostly basal, oblanceolate, the blades 1.5-5 cm long, 3-7 (10) mm wide, villous, tapering to a villous petiole 1-4 (7) cm long; inflorescences cymose with the secondary branches not suppressed except in the terminal clusters of involucres; bracts 2, opposite, similar to the leaves at the lower nodes only more reduced, 2-5 cm long and 2-5 (7) mm wide, short petiolate, becoming linear-oblanceolate to linear and acuminate above, aciculate; involucres solitary, the tube cylindrical, 3-angled but 6-ribbed, 2.5-3.5 mm long, pubescent with long villous hairs, the margins thin, rose-pink and restricted to the basal portion of the teeth, the teeth spreading, the uncinat awns of two sizes, the larger ones 0.7-1.3 mm long with the anterior one mostly 1-1.3 mm long, these alternating with the smaller ones 0.3-0.7 mm long; flowers slightly exerted beyond the involucre, cylindric, 2.5-4 mm long, the tube white, the lobes pink to rose, pubescent without along the midribs with the hairs typi-

cally extending beyond the apex, on pedicels 0.2-0.4 mm long, the tepals monomorphic, oblanceolate to narrowly oblong, mostly rounded and erose apically, united about a quarter of their length; *stamens* 9, included, the filaments 2-3.5 mm long, glabrous, the anthers 0.6-0.8 mm long, oblong, red or maroon; *achenes* light brown, 3.5-4 mm long.

Dry rocky to sandy outcrops in annual grassland islands in the Santa Cruz Mountains near Scotts Valley, Santa Cruz Co., California, from 750-800 ft elev; flowering from (Apr) May-Jun (Jul).

Specimens Examined: UNITED STATES. CALIFORNIA: Santa Cruz Co.: S of "Cupcake Hill," beyond W end of Casa Way, Scotts Valley, 28 Apr 1989, *Morgan 1562* (MARY); S slope of "Reservoir Ridge" between Tabor Drive and Glenwood Drive, Scotts Valley, 3 May 1989, *Morgan 1585* (CAS, MARY); N of Casa Way, Scotts Valley, 24 May 1989, *Morgan 1619* (MARY); "Santa's Village meadow," N of Navarra Drive, Scotts Valley, 7 Jun 1989, *Morgan 1650* (MARY); Santa Cruz Mountains, 13 Jul 1882, *Pringle s.n.* (F, G, LE, MIN, MPU, NY, PENN, US, VT, WU).

Three populations of *Chorizanthe robusta* var. *hartwegii* are known. All are located within about one and a half kilometers of each other in fragmented islands of annual grassland extending over some three hundred acres. Mixed evergreen woodlands occur on three sides with urban development to the south. All three sites are located near the northern end of Scotts Valley and are wholly or primarily within the city limits.

The westernmost population is the largest and consists of several thousand individuals in a roughly triangular-shaped area of approximately 40 acres. It is found to the west of Glenwood Drive within and just outside the city limits of Scotts Valley, and extends from Casa Way northward along the foot of a low escarpment. This population, herein termed the Casa Way population, may be differentiated into three subpopulations on the basis of the substrate and associated species.

The southeastern subpopulation, immediately north of Casa Way, is the most distinctive. Plants of var. *hartwegii* are associated with bare patches of Santa Cruz Mudstone in the midst of gentle, grassy slopes. There is no "soil" on these mudstone barrens, the surface being covered with a thin layer of finely pulverized, whitish mudstone. The var. *hartwegii* occurs with *Arenaria californica*, *Lasthenia chrysostoma*, *Trifolium grayi*, *T. depauperatum*, *Lepidium nitidum*, *Hemizonia corymbosa* and a few other less obvious annual herbs. In early spring, these patches stand out conspicuously from the surrounding grasslands because of the yellow *Lasthenia*; later in the spring this is replaced by the duller yellow of the *Hemizonia* and the rose-pink of the *Chorizanthe*.

The southeastern subpopulation occurs on exposed bedrock outcrops of the Purisima Formation that slopes to the west. Associated species include *Arenaria douglasii*, *Trifolium albopurpureum*, *Gilia clivorum*, *Lomatium caruifolium*, *Calochortus luteus*, *Clarkia purpurea*, *Corethrogyne filaginifolia*,

Trichostema lanceolatum, *Silene gallica*, *Filago gallica* and *Vulpia*.

The northern subpopulation extends along the eastern base of an escarpment of Purisima Sandstone. The var. *hartwegii* is growing on loose sand at the foot of the slope in association with *Trichostema lanceolatum*, *Lotus purshianus*, *Corethrogyne filaginifolia*, *Navarretia atractyloides*, *Erodium botrys*, *Filago gallica* and *Vulpia*.

The second population consists of less than a thousand individuals scattered over an area of approximately one acre. It is found on a relatively bare, south-facing slope composed of Santa Cruz Mudstone located north of Vine Hill School on the east side of Glenwood Drive. This colony is herein termed the Vine Hill population. The var. *hartwegii* is associated with *Corethrogyne filaginifolia*, *Lotus purshianus*, *Erodium botrys*, *Silene gallica*, *Filago gallica*, *Gastridium ventricosum*, *Bromus mollis* and *Vulpia*. Unlike the Casa Way population which is no longer grazed, the Vine Hill population currently is lightly grazed by horses.

The easternmost population is on a mudstone-based "flower field" dominated by *Lasthenia chrysostoma*, *Trifolium grayi*, *T. depauperatum*, *T. albopurpureum*, *Orthocarpus densiflorus*, *Lepidium nitidum*, *Lupinus nanus*, and other annual herbs. The Polo Ranch population, as it is termed here, consists of approximately one thousand individuals with the majority concentrated on a three acre site, in close association with *Arenaria californica*. At present, this colony is heavily grazed by horses during the late spring and summer, but without any apparent detriment to the long-term survival of the var. *hartwegii* or the other native annuals.

Three related entities occur near the known colonies of *Chorizanthe robusta* var. *hartwegii*. All of these are on sands derived from the Santa Margarita Formation and are associated with chaparral rather than grassland. The most common is *C. pungens* var. *hartwegiana* which is found on deep moving sand about one kilometer north of var. *hartwegii*. About four kilometers to the west (in addition to large populations of *C. pungens* var. *hartwegiana*) is the less common *C. diffusa* Benth. in A. DC. To the south is the rare var. *robusta*, about five kilometers distant from the nearest population of var. *hartwegii*.

ACKNOWLEDGMENTS

A general research board grant from the Graduate School of the University of Maryland is acknowledged. Dr. Edward E. Terrell and Clare B. Hardham reviewed the paper. This is Scientific Article A-5015, Contribution Number 8063, Maryland Agricultural Experiment Station.

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ADDITIONS TO THE FLORA OF NEW MEXICO¹

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ABSTRACT

Fifteen new collections of plants are reported for New Mexico: *Rapistrum rugosum*, *Sisymbrium loeselii*, *Chamaesyce abramsiana*, *Bouteloua eludens*, *Catabrosa aquatica*, *Deschampsia danthonioides*, *Digitaria ciliaris*, *Hilaria swallenii*, *Hordeum arizonicum*, *Hordeum distichum*, *Muhlenbergia arizonica*, *Poa alpina*, *Tridens eragrostoides*, *Phalaris minor* and *Vulpia bromoides*.

KEY WORDS: Floristics, New Mexico.

CRUCIFERAE (BRASSICACEAE)

Rapistrum rugosum (Linnaeus) Allioni: Eddy Co: newly planted alfalfa field adjacent to hwy 31, approximately 5 miles east of jct of hwys 31 and 285, on Lloyd Stevens farm, large dense stand, 3000 ft, April 1989, *D. Leisner s.n.* (NMCR). A native of Eurasia, this species is a sporadic adventive in the United States (Correll & Johnston 1970).

Sisymbrium loeselii Linnaeus: Taos Co: along hwy 3 between Placitas and Taos, weedy roadside community, forming a dense stand, 22 June 1988, *Allred 4737* (NMCR). Previously known from Colorado, Montana, the northern Plains States and occasionally adventive in the eastern United States (Great Plains Flora Association 1986).

EUPHORBIACEAE

Chamaesyce abramsiana (L. Wheeler) Burch: Luna Co: disturbed sandy, gravely soil along hwy 26, just south of Cooke's Range, T22S R8W Sec 25 SE 1/4 of SW 1/4, 4420 ft, 2 Oct 1987, *Columbus 1875 1/2* (NMCR). Previously

¹Journal Article No. 1404, New Mexico Agricultural Experiment Station, New Mexico State University, Las Cruces.

reported from Sonoran Desert regions of Arizona, southeastern California and northwestern México (Munz 1974).

GRAMINEAE (POACEAE)

Bouteloua eludens Griffiths: Hidalgo Co: Guadalupe Canyon, about 1 mile east of Arizona state line, T34S R22W Sec 11, juniper/oak scrubland with *Juniperus erythrocarpa*, *Krameria parvifolia*, *Erioneuron pulchellum*, *Hilaria belangeri*, *Bouteloua eriopoda* and *Tridens muticus*, loose, gravely soil, about 5000 ft, 29 August 1986, *Allred 4233* (NMCR). Previously known from southern Arizona and northern Sonora, México (Gould 1951). Easily distinguished from other New Mexico species by its silvery pilose glumes and triangular shaped spikelet clusters.

Catabrosa aquatica (Linnaeus) Beauvois: Colfax Co.: Black Lake, near the lake, around springs, on NW facing slope, above Little Coyote Creek, east of Hwy 38, low end of valley in *Festuca idahoensis* grassland surrounded by mixed conifer forest, east slope of the Sangre de Cristo Range, 8530 ft, 14 July 1986, *R. Soreng 3049-135* (NMCR). Previously known in North America from Canada and the western, mostly mountainous, United States. Although reported for New Mexico by Holmgren & Holmgren (1977) and Martin & Hutchins (1980), there were no literature reports nor specimens known confirming this. This collection represents the first verified and documented collection of this species from New Mexico.

Deschampsia danthonioides (Trinius) Benth: Torrance Co: McIntosh, weed in sod farm, 6500 ft, 4 June 1986, *R. Lee s.n.* (NMCR). Previously known from scattered localities in much of western North America (Arnou 1987). The only other species of *Deschampsia* known from New Mexico is *D. caespitosa* (Linnaeus) Beauvois.

Digitaria ciliaris (Retzius) Koeler: Chaves Co: Roswell, 4000 ft, 23 Sep 1938, *R. Duvall 1815* (NMCR). Doña Ana Co.: on campus of New Mexico State University, 3900 ft, 10 Oct 1935, *K.W. Parker 645* (NMCR). A weed of temperate and tropical regions of the world, but not previously reported in the literature for New Mexico (Webster 1988).

Hilaria swallenii Cory: Luna Co: Cooke's Range, on north facing slope overlooking Cooke's Canyon, T21S R8W Sec 27, semi-desert savannah with *Juniperus erythrocarpa*, *Dalea brachystachys*, *Muhlenbergia arenicola* and *Acalypha neomexicana*, rocky soil, 5000 ft, 10 October 1987, *Columbus 1921* (NMCR). Previously known from western Texas and northern México (Cory 1948). Similar to *Hilaria belangeri*, which also occurs on Cooke's Range.

Hordeum arizonicum Covas: Doña Ana Co: along hwy 85, about 1 mile south of Radium Springs and 0.5 mile west of the Rio Grande, disturbed roadside flora with *Hordeum murinum* subsp. *glaucum*, *Aristida purpurea* and *Tesaria sericea*, gravely ground, 3900 ft, April 1988, *R. Kochevar 29* (NMCR).

Doña Ana Co: field at 1600 W. Hadley Street, disturbed weedy site with *Hordeum murinum* subsp. *glaucum*, clay soil, April 1988, *R. Hallford 9* (NMCR). Previously known conclusively from Arizona and California, and reported from Baja California, México (Baum & Bailey 1988). Similar to the wide ranging *Hordeum pusillum*, which flowers slightly later in southern New Mexico. In our plants of *Hordeum arizonicum*, the glumes of the central spikelet are sub-setaceous, but the inner glumes of the lateral spikelets are definitely dilated.

Hordeum distichum Linnaeus: Doña Ana Co: waif from cultivation, about 0.5 mile south of Mesilla Dam in field on western bank of the Rio Grande, with *Avena fatua* var. *sativa*, sandy soil, 3900 ft, 13 April 1987, *R. Vega 17* (NMCR). Cultivated as a cereal grain (two rowed barley) in many parts of the world and undoubtedly at various times and places in New Mexico, but not heretofore reported in the literature for New Mexico. Although perhaps more accurately considered only a variant of *Hordeum vulgare* (Baum 1983), it seems desirable to document the occurrence of this entity as a member of the adventive flora of New Mexico.

Muhlenbergia arizonica Scribner: Hidalgo Co: Everhart Ranch turnoff, T29S R15W Sec 21, 4360 ft, 6 Nov 1976, *T. Heiner 19* (SNM). Hidalgo Co: Peloncillo Mts, Skeleton Canyon, Coronado National Forest, about 1/4 mile east of Arizona state line, T31S R22W Sec 23, rocky uplands in *Acacia/Bouteloua* grassland community, 4800 ft, very thick stand in soil filled basin, 15 Sep 1989, *Allred 5013* (NMCR). There is another collection from Hidalgo Co (Hachita Valley) at SNM. Previously known from southern Arizona and northwestern México (Gould 1951). Similar to *Muhlenbergia torreyi*, but with flat or folded, stiffer blades and awnless glumes.

Phalaris minor Retzius: Doña Ana Co: along hwy 28 south of Mesquite at edge of cultivated field, T25S R2E Sec 1, growing with *Phalaris caroliniana*, loamy soil, 20 April 1988, *J.A. Castello 26* (NMCR). Introduced from the Mediterranean region and known from widely scattered localities in the United States and México (Anderson 1961).

Poa alpina Linnaeus: Taos Co: Sangre de Cristo Mts, headwaters of branch of Jarocito Creek, 36° 58' 05" N, 105° 20' 30" W, moist *Deschampsia* meadow, 12120 ft, 14 Aug 1982, *R.S. Peterson 82-320* (NMC). Martin & Hutchins (1980) and Bernard & Potter (1984) reported the occurrence of *Poa alpina* for New Mexico, but no authenticated specimens were known from the state's herbaria and both Soreng (1985) and Allred, et al. (1986) omitted this species as being verifiably present in New Mexico. The collection cited here is the first confirmed specimen of *Poa alpina* from the state.

Tridens eragrostoides (Vasey & Scribner) Nash: Luna Co: Koenig Ranch allotment near abandoned ranch, T27S R8W Sec 23 (also seen in T27S R7W Sec 16), with *Atriplex canescens*, *Gutierrezia sarothrae*, *Prosopis glandulosa*, *Hilaria mutica*, loamy clay, 1 Aug 1986, *L. Bevacqua s.n.* (NMC). Previously reported from Texas, Arizona, Florida, northern México and Cuba (Gould

1975). This collection is of rather young plants that are apparently flowering the first season. The species is reported as being perennial.

Vulpia bromoides (Linnaeus) S.F. Gray: Sandoval Co: Bandelier National Monument, Frijolito Rim Trail, 2.5 miles south of Frijolito Ruin, piñon/juniper mesa land, 15 May 1983, R.A. Salazar 6 (NMCR). Previously known from scattered localities in the United States, especially on the west coast, and including nearby Texas and Arizona (Lonard & Gould 1974).

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**RUDBECKIA TEXANA, A TAXON WORTHY OF SPECIFIC STATUS
(ASTERACEAE: HELIANTHEAE)**

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ABSTRACT

Rudbeckia nitida var. *texana* is judged to be specifically distinct from the typical variety of *R. nitida* and is therefore elevated in rank as *R. texana*.

KEY WORDS: Systematics, *Rudbeckia*, Asteraceae, southeastern United States, endangered species.

Rudbeckia nitida Nutt. is a member of *R.* sect. *Macrocline* Torrey & Gray, and as treated by Perdue (1962), consists of two varieties. The typical variety occurs in Alabama, Florida and Georgia and *R. nitida* var. *texana* Perdue is known from Louisiana and eastern Texas. Recent phenetic analyses support the elevation of *R. nitida* var. *texana* to specific rank (Cox & Urbatsch 1988 and in prep.). The purpose of this publication is to validate this new name as expeditiously as possible in order that it might be used in various forthcoming publications concerning this taxon.

Rudbeckia texana (Perdue) Cox & Urbatsch, *stat. nov.* BASIONYM: *Rudbeckia nitida* Nutt. var. *texana* Perdue, *Rhodora* 64:328. 1962. TYPE: UNITED STATES. Texas: Chambers Co., in prairie along railroad, 6 miles S of Stowell, 15 May 1945, *Shinners* 7710 (HOLOTYPE: SMU!).

Rudbeckia texana sporadically occurs in southeastern Texas and southwestern Louisiana in prairies and pine flatwoods along wet railways and roadside rights-of-way. *Rudbeckia nitida* has an allopatric distribution in wet to moist acidic clearings, flatwoods, savannas and swales in the longleaf pine hills of Alabama, Georgia and Florida. It is reported to be an endangered species (Kral 1983). *Rudbeckia texana* differs from *R. nitida* in having wider and shorter basal leaves, appressed palae apices and longer receptacles (cones). In *R. nitida*, the apices of the palea are reflexed at least during the flowering period.

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We are grateful to Drs. Victoria Sullivan and R. Dale Thomas for their willingness to review this note. We also thank the curators of the following herbaria for the loans of *Rudbeckia*: ASTC, COLO, F, FLAS, FSU, GA, GH, JEPS, LAF, LL, MINN, MO, NCU, NLU, NMC, OS, OSC, RM, SDU, SMU, TENN, TEX, UC, UNA and US.

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TWO NEW SPECIES OF *STYLIDIUM* FROM WESTERN AUSTRALIA

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ABSTRACT

Stylidium lowrieianum (subgenus *Tolypangium*, section *Sazifragoideae*) and *S. edentatum* (subgenus *Centridium*), both from the southern part of Western Australia, are described.

KEY WORDS: *Stylidium*, Stylidiaceae, Western Australian flora.

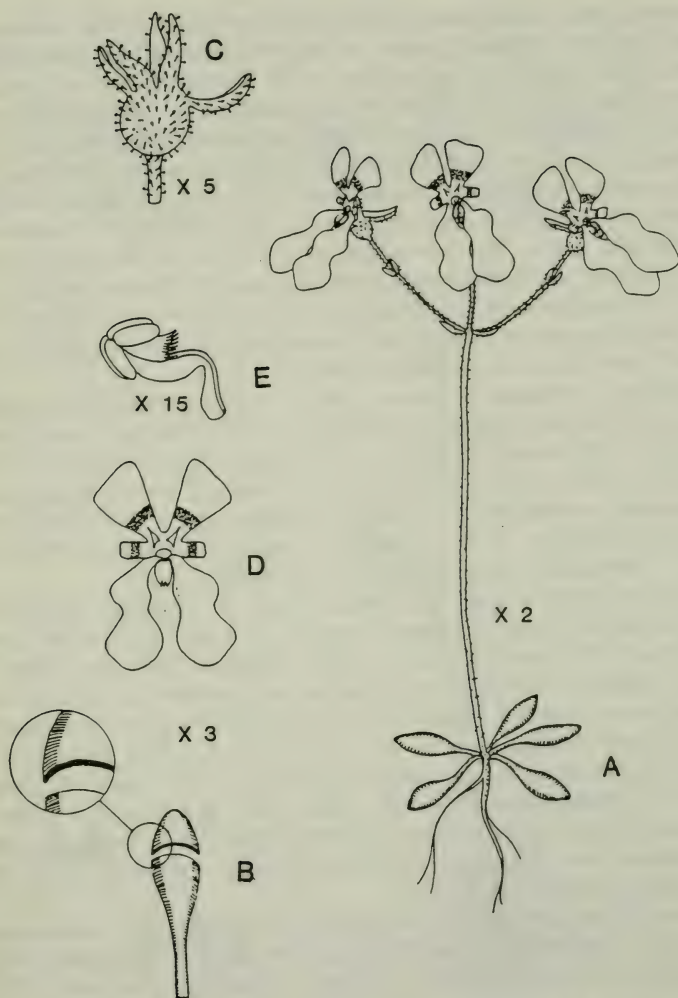
TAXONOMIC TREATMENT

Both of the new species described here are easy to place within the taxonomic system. The first belongs in the subgenus *Centridium* Lindley, the second is assigned to section *Sazifragoideae* Mildbraed of subgenus *Tolypangium* Endl. These two new species were discovered by Allen Lowrie and sent to Sherwin Carlquist.

1. *Stylidium edentatum* (Figure 1)

Stylidium edentatum Lowrie & Carlquist, *spec. nov.* HOLOTYPE: In white sands of the floodplain of the upper Phillips River, on Fitzgerald Road 2.3 km from the Hyden-Ravensthorpe Road, Western Australia, September 25, 1989, *Allen Lowrie* (RSA).

Annua pilis glanduliferis adpersa imprimis in inflorescentia. Folia radicalia, glabra, rosulata, elliptica, recurvata, in petiolum subaequilongum vel brevior angustata, cum petiolis 0.3-0.8 cm longa. Scapi solitarii corymbum laxum pauciflorum dichasie efformantem gerentes, ca 6 cm alti. Flores longi pedicellati, satis conspicui. Calycis tubus subglobosus, 2 mm altus, lobi 2 mm alti, subaequales. Corollae tubus perbrevis; laciniae inaequales, posteriores 2 cuneatae, truncatodentatae basi, anteriores longiores, hemipanduriformes. Corolla alba, basi roseomaculatae, bidenticulata. Labellum petaloideum, cymbiforme, apice fimbriatum. Columna submedio geniculata, geniculo processu retrorsum curvato non instructa, stigma barbatum inter antheras. Capsula ovatoglobosa, 2-2.5 mm longa. Semina numerosa, subglobosa.



A. Lowrie 1989.

Figure 1: *Stylidium edentatum*. A. Habit of plant. B. Leaf, with enlarged portion. C. Ovary and calyx lobes. D. Face view of flower. E. Column, showing lack of tooth.

Annual with sparse glandular hairs, hairs primarily in the inflorescence. Leaves forming a glabrous rosette at soil level (Figure 1A). Leaves elliptic, tapering into a petiole about as long as the lamina, 0.3-0.8 cm long, margins recurved (Figure 1B). Scape solitary, bearing a lax, few flowered corymb about 6 cm tall (Figure 1A). Inferior ovary subglobose, 2 mm long, calyx lobes subequal, about 2 mm long (Figure 1C). Corolla tube very short, the corolla lobes unequal, the posterior two cuneate with a truncate lateral tooth near the base, the anterior two hemipandurate in shape (Figure 1D). Corolla white, provided with a spur, with rose markings at the base of the posterior corolla lobes; two small toothlike throat appendages present; labellum petaloid, boat-shaped, with a fimbriate tip (Figure 1D). Column bent near the middle, not provided with a recurved appendage; stigma borne among anthers and strongly pilose (Figure 1E). Seeds numerous, globose.

Stylidium edentatum represents a distinctive but hitherto overlooked relative of the common species *S. calcaratum* R. Br. (Figure 2) and *S. ecorne* (F. Muell. ex Erickson & Willis) Farrell & James (Figure 3). Farrell & James (1979) have demonstrated that *S. ecorne* is worthy of specific recognition: its chromosome number and other features represent morphological distinctness and genetic isolation. If *S. ecorne* and *S. calcaratum* are distinct from each other, *S. edentatum* is equally worthy of recognition.

Stylidium ecorne (Figure 3) is distinct from *S. calcaratum* (Figure 2) by virtue of lack of a spur (compare Figure 2A, 3A) and its large seed number (Mildbraed 1908; Farrell & James 1979). *Stylidium edentatum* differs from both *S. calcaratum* and *S. ecorne* by having long petioles on leaves, by having recurved leaves (compare Figures 1B, 2B, 2C), by having no retrorse appendage on its column (compare Figures 1E, 2F, 2G, 3F, 3G). The posterior corolla lobes of *S. edentatum* are cuneate, obtuse and unlobed (Figure 1D), whereas those of *S. calcaratum* are tridentate (Figure 2D), and those of *S. ecorne* are tridentate (Figure 3D) or unlobed and acute (Figure 3E). The corolla lobes of *S. edentatum* have a distinctive blunt lateral tooth, marked with rose, at the base of each posterior corolla lobe.

Other species in subgenus *Centridium*, in addition to *S. calcaratum*, *S. ecorne* and *S. edentatum* include *S. perpusillum* Hook. f. (Mildbraed 1908), *S. ceratophorum* Schwarz (Schwarz 1927) and *S. longicornu* (Carlquist 1979).

2. *Stylidium lowrieianum* (Figure 4)

Stylidium lowrieianum Carlquist, *spec. nov.* HOLOTYPE: In sandy soil beneath *Agonis flexuosa* trees, Wilderness Road, 1 km west of Caves Road, Western Australia (County Road Directory of Western Australia map 14, E8), November 4, 1988, Allen Lowrie (RSA).

Perennis fere glabra saepe glaucescens, caudice elongato, nodoso. Folia radicalia, dense rosulata, oblanceolata, petiolata, acuta,

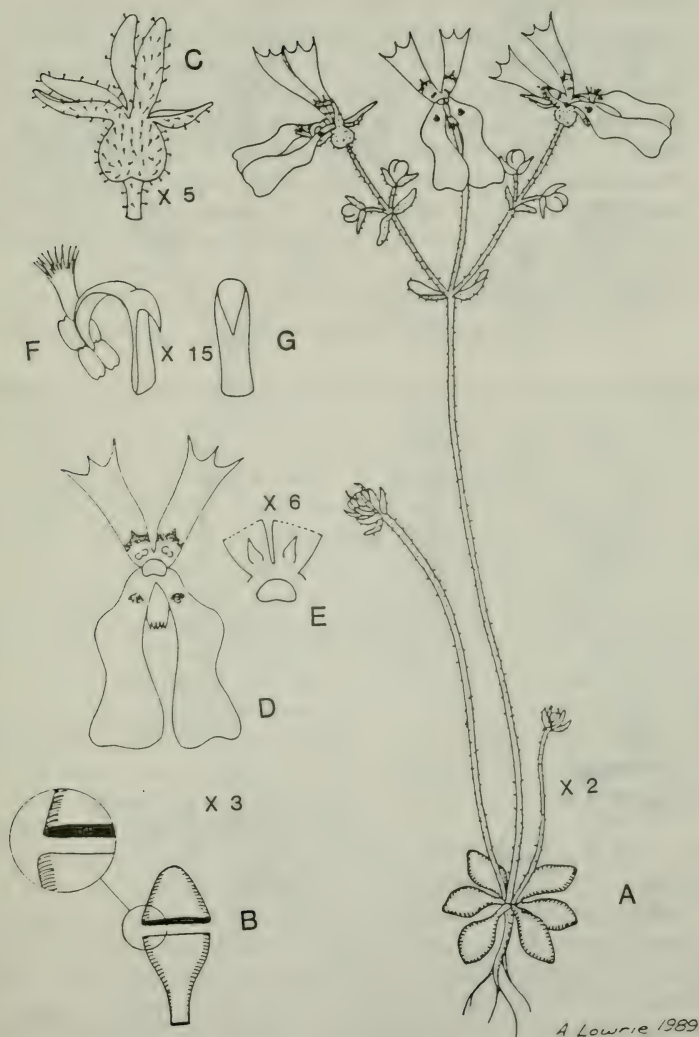
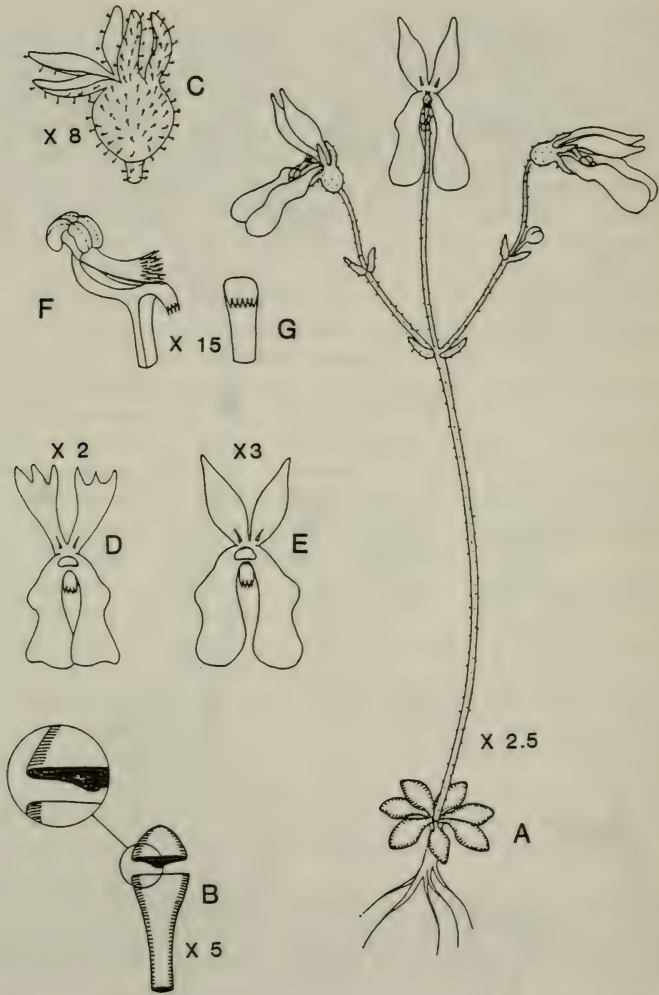


Figure 2: *Stylidium calcaratum*. A. Habit of plant. B. Leaf, with enlarged portion. C. Ovary and calyx lobes; D. Face view of corolla. E. Base of corolla lobes to show throat appendages. F. Lateral view of column. G. Dorsiventral view of column to show retrorse tooth.



A Lowrie 1989.

Figure 3: *Stylidium ecorne*. A Habit of plant. B. Leaf, with enlarged portion. C. Ovary and calyx lobes. D. Corolla with tridentate posterior lobes. E. Corolla with entire posterior lobes. F. Lateral view of column. G. Dorsiventral view of column, showing fringed retrorse tooth.

supra olivacea, subtus pallidiora, flabellatim venosa, parte laminae marginali undulata. Scapi racemosi, erecti, glabri vel sparse glandulosi, pruinoglaucoscenti, 50-60 cm longi, verticillis 2-3, parte superiore scaporum 2-6 bracteis sparsis alternatis instructi. Pedicelli ut videtur semper uniflori, sparse glandulosi, medio vel supra medium prophyllis 2 oppositis minutis linearibus praediti. Calycis lobi lanceolati, glabri, acuti, tubo glabro vel sparse glanduloso-pubescenti, subaequilongi, 2-2.5 mm longi. Corolla extus intusque albidorubrae, laciniae 2 posteriores cuneatae, 4.5 mm longae, 2 anteriores obovatae, 6.0 mm longae. Appendices faucis 6, 4 anteriores supra medio uniti, 2 posteriores lineares. Labellum lanceolatum, appendiculatum. Capsula quadranguloglobosa, 3 mm longa.

Perennial, glabrous and often glaucescent, growing from an elongate caudex with swellings at the nodes (Figure 4A). Rosette of basal leaves dense, the leaves thin and olive green above, paler (glaucous) below. Leaves oblanceolate, petiolate, with flabellate veins, the margin markedly undulate. Scape a glaucous raceme 50-60 cm tall, provided with 2-3 verticils of bracts plus, in the upper portion, 2-6 alternate linear bracts (Figure 4A); bracts acute. Pedicels one flowered, glandular pubescent, provided with two short opposite bracteoles below the middle, 2-2.5 mm long (Figure 4C), green. Ovary waxy glaucous, with subequal lanceolate acuminate lobes, a few glandular hairs at the base of the calyx lobes (Figure 4C). Corolla white suffused pink outside and inside, corolla lobes paired vertically, the posterior two corolla lobes cuneate, 4.5 mm long, the anterior two lobes obovate, 6.0 mm long (Figure 4D). Throat appendages 6 and without enlarged tips, the 4 anterior ones united in pairs above the middle, the 2 posterior ones linear (Figure 4E). Labellum lanceolate, with a pair of lanceolate lateral appendages (Figure 4I). Capsule ovoid-globose, four angled, exceeding 3 mm at maturity.

Stylidium lowrieianum is clearly a relative of *S. amoenum* R. Br., *S. articulatum* R. Br., *S. brunonianum* Benth., *S. glaucum* Labill., *S. maitlandianum* Pritzel and *S. striatum* Lindley. From all of these, *S. lowrieianum* differs by the markedly crisped or undulate leaf margins (Figure 4A, B), elongate stems with swollen zones (which demarcate termination of growth events), and the fusion of two pairs of throat appendages (Figure 4E). The elongate stems are related to the deep leaf litter in which this species grows. In addition, *S. lowrieianum* can be differentiated from the species mentioned in a series of characters listed in the paragraphs below.

Stylidium amoenum has the following features different from those of *S. lowrieianum*: leaves thick; a single whorl of bracts present on the inflorescence; pedicels reddish brown; lowermost pedicels two flowered; ovary conspicuously glandular and reddish; corolla lobes paired laterally; throat appendages in threes, with enlarged tips; labellum without appendages.

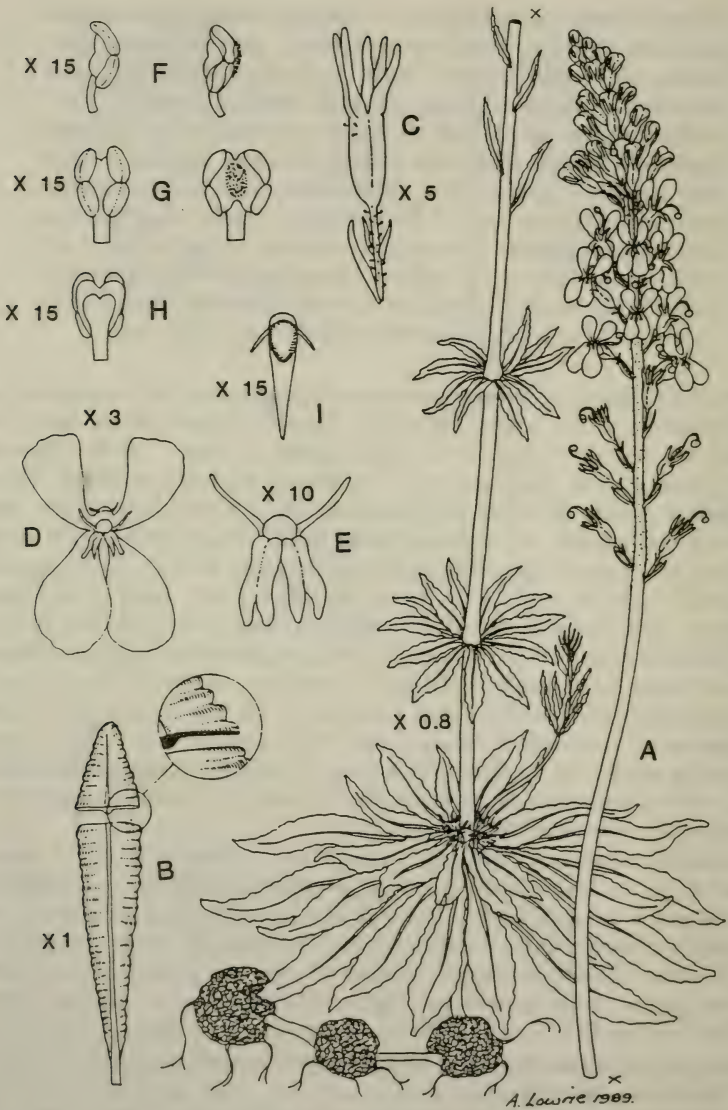


Figure 4: *Stylidium lowricanum*. A. Habit of plant. B. Leaf, with enlarged portion. C. Pedicel, ovary and calyx lobes. D. Face view of corolla. E. Throat appendages of corolla. F. Lateral view of column tip (with stigma grown out, right). G. Face view of column tip (with stigma grown out, right). H. Back view of column tip. I. Labellum.

Stylidium articulatum has apparently not been collected since the Drummond collection cited by Mildbraed (1908), and is thus an incompletely known species. From the description by Mildbraed (1908), however, one may cite the following features of *S. articulatum* by which it appears to differ from *S. lowrieianum*: leaves thick; inflorescence short and stout with one or two whorls of bracts; pedicels densely glandular hairy; ovary glandular, 5 mm long; calyx lobes blunt; corolla appendages capitate; labellum without appendages; capsules 6-8 mm long.

Stylidium brunonianum has the following features not seen in *S. lowrieianum*: leaves narrow, lanceolate, not disposed in a flat rosette; leaves equally glaucous on both surfaces; pedicels dark red; calyx lobes blunt; corolla rosy pink; throat appendages of corolla capitate; labellum without appendages.

Stylidium glaucum has the following features not found in *S. lowrieianum*: leaves ovate-spatulate; scapes often several; scapes with a single whorl of bracts but many scattered alternate bracts; lowermost pedicels two flowered; pedicels glabrous; corolla with dark spots at the bases of corolla lobes; throat appendages curved; labellum without appendages.

Stylidium maitlandianum differs from *S. lowrieianum* by having the following features: leaves thick, semisucculent, in a flat rosette with leaves of various lengths, displayed in imbricate fashion; leaves with a conspicuous translucent hyaline margin; flowers along more than half the length of the inflorescence; calyx lobes blunt; labellum without appendages.

Stylidium striatum has the following character states not seen in *S. lowrieianum*: leaves short (typically 3 cm long, 0.8 mm wide); inflorescences with only one or two verticils of bracts; lowermost pedicels sometimes two flowered; pedicels reddish; inflorescence bracts blunt; calyx lobes blunt; corolla appendages capitate.

Other species in section *Saxifragoideae* of subgenus *Tolypangium* are farther from *S. lowrieianum* than the above species. The closest, of species not hitherto mentioned, are perhaps *S. carnosum* Bentham and *S. diversifolium* R. Br., which have thick, succulent leaves; densely glandular ovaries; blunt calyx lobes; corolla lobes white, paired laterally; capitate throat appendages; and no appendages on the labellum.

The above review demonstrates that *S. lowrieianum* is not closer to any one species in the group than to others. The species with which it is most closely compared are approximately equidistant from each other.

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A NEW SPECIES OF MEXICAN *ARCHIBACCHARIS* (COMPOSITAE:
ASTEREAE)

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ABSTRACT

A new species, *Archibaccharis venturana*, from Veracruz, México, is proposed. It is similar to *A. salmeoides* but distinct in its much smaller and more numerous heads.

KEY WORDS: *Archibaccharis*, Astereae, Asteraceae, México.

Recent collections have revealed the existence of a new species of *Archibaccharis* from the state of Veracruz, México, which is described below.

Archibaccharis venturana Nesom, *spec. nov.* TYPE: MÉXICO. Veracruz: Mpio. Villa Aldama, 5 km N of Hwy 140 at Cruz Blanca on road to Las Minas, 14 km (air) NE of the town of Perote, 2300 m, extremely steep slopes, top of canyon at edge of plateau, volcanic bedrock, with *Quercus* spp., *Pinus patula*, *Alnus acuminata* ssp. *arguta*, *Arbutus xalapensis*, 24 Aug 1986, M. Nee 32893 (HOLOTYPE: TEX!; Isotypes: ENCB,F,MEXU,MO,NY,XAL).

A. salmeoides (S.F. Blake) S.F. Blake similis sed capituliis numerosioribus multo minoribus et flosculis minoribus differt.

Scandent (scrambling, arching, leaning on other plants), herbaceous subshrubs. Stems noticeably but not strongly zig-zag, eglandular, sparsely and loosely pilosulous with trichomes having colored cross walls. Leaves thick, the upper surface slightly shiny, with a tight, slightly raised reticulum, glabrous except for a few hairs along the veins, the lower surface with a few scattered hairs, the blades lanceolate-ovate with short acuminate apices and rounded to obtuse bases, 45-70 mm long, 18-30 mm wide, on petioles 9-11 mm long, the margins serrulate apiculate with 8-12 pairs of teeth. Capitulescences axillary and terminal, in rounded, ebracteate panicles. Staminate heads not seen. Pistillate heads with 8-10 filiform pistillate flowers and 2 central, staminate flowers; phyllaries ovate-lanceolate, purple tinged, with fringed ciliate margins,

in 3-4 graduated series, the inner phyllaries 2.0-2.5 mm long, the outer 1/4-1/3 as long, sparsely hairy. Pistillate corollas eligulate, with tube 1.0-1.1 mm long, hairy, the style 1.8-2.0 mm long, with branches 0.2-0.5 mm long. Staminate corollas 2.0-2.4 mm long, the throat 1.0-1.4 mm long, green to purple, prominently pubescent with divergent, yellowish, thick clavate hairs, the lobes 0.6-1.0 mm long, purple; style branches lanceolate, 0.3-0.4 mm long. Achenes short hairy, ca 1.0 mm long; pappus of barbellate bristles.

Additional collection examined: MEXICO. Veracruz: Mpio. Acajete, Mazatepec, ladera de cerro, vegetacion de bosque de Tejocote, 1910 m, 5 Jul 1972. *F. Ventura* A. 5660 (ENCB, distributed as *A. schiedeana*).

The epithet commemorates Francisco Ventura, prolific and discriminating collector of the Polytechnic Institute of Mexico (ENCB). The Ventura collection cited above has been annotated by B.L. Turner and by the author as being similar to but very atypical of *Archibaccharis salmeoides*. With the recent collection of ample and geographically similar material by Michael Nee, it is possible to recognize the species as distinct.

Archibaccharis venturana is similar to *A. salmeoides* (sect. *Hirtella*; [Jackson 1975]) in its scandent habit and in having stems that are hairy and eglandular, leaves that are thick, glabrate, shiny (above), petiolate and ovate-lanceolate, and disc corollas that are purple. The new species is strikingly different in its much smaller, more numerous and densely packed heads. More easily quantifiable differences are summarized in the following couplet.

1. Pistillate heads with phyllaries 2.0 mm long, with 2 staminate flowers, the corollas 2.0-2.4 mm long; flowering July-August; west central Veracruz *A. venturana*
1. Pistillate heads with phyllaries 4.0-6.5 mm long, usually with 1 staminate flower, the corollas 3.2-4.4 mm long; flowering November-February; known from Veracruz, Guerrero, Michoacán, Chiapas and Guatemala *A. salmeoides*

ACKNOWLEDGMENTS

I thank Billie Turner and Ted Barkley for their reviews of this manuscript and Michael Nee for additional comments on *Archibaccharis venturana* as well as distribution of the isotypes.

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EFFECT OF Ca^{+2} AND CHOLESTEROL ON ANTHOCYANIN FORMATION IN TURNIP SEEDLINGS

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ABSTRACT

The promotion of anthocyanin synthesis in turnip seedlings by five min exposure to red (R) light is inhibited by subsequent application of CaCl_2 . The stimulation of dark synthesis of anthocyanin by n-propanol or by kinetin is also reduced by Ca^{+2} and by cholesterol, both of which are well known to stabilize cell membranes. By contrast, EDTA, which chelates Ca^{+2} , promotes dark synthesis of anthocyanin. Assay of native Ca^{+2} extractable from seedlings immersed in EDTA demonstrates that R light exposure promotes a highly significant increase in extractable Ca^{+2} .

KEY WORDS: Physiology, *Brassica*, anthocyanin, light response.

INTRODUCTION

It is well known that anthocyanin synthesis is promoted by light. In *Celosia* seedlings (Malaviya & Laloraya 1966) and buckwheat hypocotyl (Troyer 1964), anthocyanin synthesis is light dependent. Pecket & Hathout (1974a) suggested, from work on the low energy red (R)/far red (FR) reversible control of anthocyanin biosynthesis, that the locus of phytochrome action is in a membrane. Evidence for this view came from the fact that reagents such as n-propanol, which are believed to increase membrane permeability, cause a stimulation of dark synthesis of anthocyanin in red cabbage which can be nullified by exposure to far red light (Pecket & Hathout 1974b). It was suggested that the molecular configuration of phytochrome controls the passage of a substrate through a membrane to the site of anthocyanin biosynthesis. Further evidence for this view was provided by the fact that exogenously applied phenolic precursors, such as shikimic acid, promote dark synthesis of anthocyanin much more markedly after treatment of the tissue with propanol. Evidence has also been presented that kinetin, or red light, promotes anthocyanin synthesis in dark grown red cabbage and that its effect can be reversed by far

red light (Pecket & Hathout 1974a). Pecket & Small (1980), studied the site of anthocyanin synthesis in red cabbage seedling and reached the conclusion that the organelles responsible for anthocyanin formation (anthocyanoplasts) are found in the vacuoles of the plant cells and are the site of anthocyanin biosynthesis. Oelmüller & Mohr (1985), found that anthocyanin formation in milo seedlings occurs only in white and blue light, while red light and far red light are totally ineffective.

If the effects of light, kinetin and reagents such as propanol are indeed upon membrane permeability, then it would be expected that reversals of their effects should be brought about by the application of reagents such as calcium chloride (Davson 1951; Burstrom 1952), and cholesterol (Grunwald 1968), which are well known to act as membrane stabilizers. The work reported here concerns further investigation of the membrane based, phytochrome controlled, anthocyanin synthesis as evidenced by the effects of these membrane stabilizing agents.

MATERIALS AND METHODS

Seeds of turnip (*Brassica rapa*) provided from the Ministry of Agriculture were sown in Petri dishes, each having 25 seeds on two filter papers, moistened with 20 ml distilled water. They were germinated in the dark at 25° C.

Light sources.

Red light exposures were carried out in a cabinet illuminated by 4 fluorescent lamps, employing two sheets of red cinemoid No. 14 and one sheet of orange cinemoid No. 5.

Far red (FR) exposures were given in a cabinet illuminated by 4 fluorescent lamps and a filter system comprising two sheets of blue cinemoid No. 20 and two of orange No. 5, with a water screen between the lights and filters. Both chambers were placed in a dark room and all manipulations of material were carried out under a green safe light.

Anthocyanin extraction, assay and chromatography.

The anthocyanin in samples of 25 seedlings was completely extracted using 10 ml of 1% HCl in three successive aliquots of 5, 3 and 2 ml (Murave'va & Bubenchikova 1987). In the first aliquot the tissue was kept in a boiling water-bath for 20 min to facilitate the extraction of the pigment, the extracts were then filtered. Absorbance of the supernatant was measured at 525 nm using a Perkin Elmer spectrophotometer. The bulk of anthocyanin in the seedlings was in the cotyledons, but some was in the hypocotyls. In the experiment reported herein, total values are given. Chromatographic separations of anthocyanin extracts were carried out, with cyanidin as a reference, on paper

in water:glacial acetic acid:conc hydrochloric acid, 10:30:3 (by volume) (Bate-Smith 1954) and in n-butanol:2N hydrochloric acid, 1:1 (by volume) (Bate-Smith & Westall 1950). Unhydrolyzed 1% HCl extracts were chromatographed in n-butanol:glacial acetic acid:water, 12:3:5 by volume (Smith & Smith 1965).

Propanol, kinetin and EDTA treatments.

Two day old dark grown seedlings were transferred to a fresh Petri dish containing 4 ml of 1% n-propanol, 0.2% Kinetin or 0.5 mM EDTA for 15 min before or after exposure to R or FR light followed by return to the original dish. Control seedlings were treated in the same way using H₂O. A similar procedure was adopted for the CaCl₂ (7 mM) and cholesterol (0.1 mM) treatments but the seedlings were kept in the reagents for 48 hours (Pecket & Hathout 1974a).

Extraction of calcium:

Eighty seedlings were immersed in 20 ml EDTA (0.5 mM) or water for 15 minutes. The eluate was evaporated to dryness and the residue dissolved in 20 ml H₂O. To 1 ml, an equal volume of 6.5% lanthanum was added and the extracted Ca⁺² content assayed with a Perkin Elmer atomic absorption spectrophotometer at 422 nm. A calibration curve of Ca⁺² in water was also carried out.

RESULTS AND DISCUSSION

In preliminary work it was established that the biosynthesis of anthocyanin in dark grown seedlings of turnip is unaffected by treatment with CaCl₂ over the range 0-10 mg/l. However, the application of CaCl₂ to two day old dark grown seedlings following a five minute exposure to red light nullifies the effect of the light treatment (Table 1). These results are consistent with the view that calcium has a stabilizing effect on a membrane which is involved in the regulation of the passage of substrate(s) of anthocyanin biosynthesis in red cabbage to the enzymes involved in the synthesis (Pecket & Hathout 1974b).

The stimulation of dark synthesis by propanol and by kinetin is markedly reduced by subsequent treatment with CaCl₂. Cholesterol also reduces the stimulatory effects of R light, propanol or kinetin (Table 1).

Seedlings were grown for two days in darkness and then treated for five min with R light, 1% PrOH or 0.2% kinetin for 15 min. Immediately after these treatments, CaCl₂ (7 mM) or cholesterol (0.1 mM) was applied to the seedlings for a further period of 48 hr in darkness. The figures are means of eight observations and standard errors are shown.

If the effect of applied calcium is to stabilize the membrane and thereby prevent the increase in permeability induced by such factors as R light, then

Table 1: Effect of CaCl_2 and cholesterol on anthocyanin synthesis in turnip seedlings.

Treatment	Anthocyanin content (525 nm)			
	Dark	R	PrOH	Kinetin
Water	0.32 ± 0.02	0.47 ± 0.02	0.65 ± 0.02	0.49 ± 0.02
CaCl_2	0.30 ± 0.02	0.31 ± 0.03	0.39 ± 0.03	0.32 ± 0.02
Cholesterol	0.35 ± 0.02	0.35 ± 0.02	0.36 ± 0.02	0.34 ± 0.03

it is possible that native calcium in the membrane may itself be involved in the normal regulation of the passage of substrates. In order to investigate this possibility, the influence upon anthocyanin synthesis of EDTA (which chelates Ca^{+2} [Burstrom 1968; Foote & Hanson 1964]) was investigated. Seedlings were treated with EDTA for 15 min before or after five min exposure to R or FR light. EDTA stimulates anthocyanin synthesis in dark grown seedlings (Figure 1). When applied either before or after R light treatment, EDTA does not appear to promote a greater stimulation than R light on its own. However, when FR exposure is employed instead of R, the effect depends upon the sequence of the treatments. Application of EDTA promotes synthesis when applied before the FR exposure but not when the sequence is reversed (Figure 1). These results suggest that FR light may in some way render native calcium less readily chelatable by EDTA. However, if the EDTA treatment precedes the FR exposure, insufficient free Ca^{+2} is present to stabilize the membrane.

Anthocyanin synthesis in the seedlings takes place in the epidermal and sub-epidermal cells of the cotyledons and hypocotyl (Peckett & Small 1980). Chromatographic examination revealed the same major anthocyanin in cotyledons and hypocotyl of turnip seedlings. This was a glycoside of cyanidin. Harborne (1963) reported the pigment of red cabbage to be cyanidin-5-glucoside-3-sophoroside (in acylated form). The principal site of synthesis is the cotyledons, and it would therefore appear likely that the effects of EDTA reported above arise following the uptake and translocation of this substance to the sites of anthocyanin synthesis. In an attempt to ascertain whether this explanation, concerning the binding of Ca^{+2} might be valid, assays of extractable Ca^{+2} were carried out on solutions in which seedlings had been completely immersed for 15 minutes after a five minute exposure to R or FR light. When water was used for extraction, only small quantities of Ca^{+2} were removed and no significant differences were found between the treatments (Figure 2).

However, when EDTA was employed as extractant, a substantially larger amount of Ca^{+2} was removed and there was a highly significant increase in extractable Ca^{+2} from seedlings which had received a prior exposure to five minutes R light (Figure 2). Assays of extractable Ca^{+2} from separated cotyledons and hypocotyls revealed that approximately twice as much Ca^{+2} came

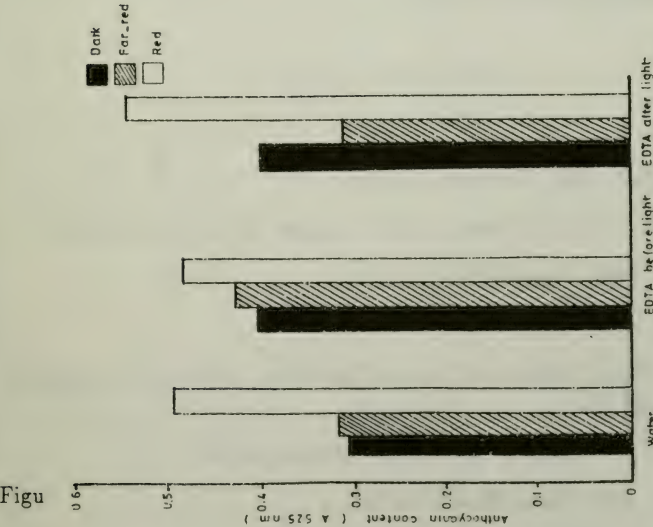


Fig (1) Effect of EDTA on phytochrome controlled anthocyanin synthesis in turnip.

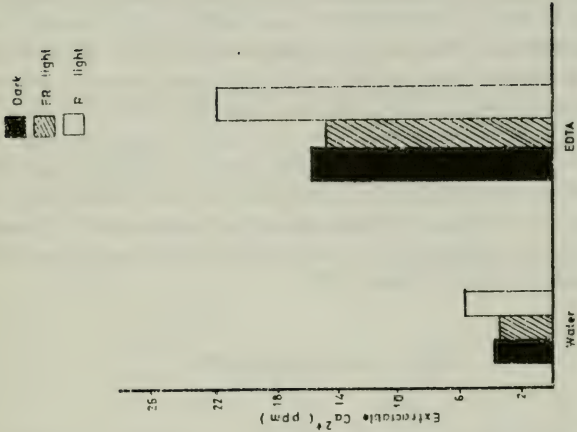


Fig (2) Effect of R, FR and darkness on extractable Ca^{2+} from seedlings of turnip.

from the former organs, the principal site of anthocyanin synthesis. These observations suggest that the photocontrol of anthocyanin biosynthesis may involve changes in permeability which result from alterations in the capacity to bind Ca^{+2} into a membrane. It seems possible that the extent to which Ca^{+2} is bound into a membrane and thereby stabilizes the membrane, is a function of the molecular configuration of the phytochrome molecule. If this is so, then the Pr form of phytochrome must have a greater capacity to bind Ca^{+2} than the Pfr form. It is generally assumed that Pfr is the active form of phytochrome in respect to the promotion of photomorphogenetic events (Hendricks & Borthwick 1967). The interpretation placed upon this data implies that the activity of Pfr may result from its being less able to bind Ca^{+2} in membrane(s). The increase in permeability which would result would lead to the freer movement of substances of importance in plant development through the membranes. The evidence presented herein is consistent with Pr exercising a restraint upon the movement of substrates for anthocyanin biosynthesis by virtue of its greater ability to bind Ca^{+2} .

ACKNOWLEDGMENTS

The author gratefully acknowledges Professor M. Nosseir and Dr. A.T. Khalil for reviewing this manuscript.

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TAXONOMIC STATUS OF *SINCLAIRIA ADENOTRICHIA* (ASTERACEAE:
LIABEAE)

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ABSTRACT

Sinclairia adenotricha (Greenm.) Rydb., inadvertently omitted from my recent treatment of *Sinclairia* (Turner 1989), is believed to be a hybrid derivative of *S. klattii* and *S. liebmannii*. Reasons for this disposition are briefly discussed.

KEY WORDS: *Sinclairia*, Eupatorieae, Asteraceae, México.

In my recent treatment of *Sinclairia* (Turner 1989), I inadvertently excluded the name *Sinclairia adenotricha* (Greenm.) Rydb., largely because it was known to me only by description. Subsequent examination of the holotype suggests that the plant concerned is a likely hybrid derivative of *S. klattii* x *S. liebmannii*. The only known collection of *S. adenotricha* (MÉXICO. Oaxaca: Cerro de Frujano, 1700 m, 15 Nov 1890, *C. Conzatti 2316*, F!) appears closely related to *S. liebmannii*, both possessing similar, usually lobed, rather thick leaves which presumably tend to drop shortly after flowering. While most of the vegetative characters are those of *S. liebmannii*, the larger heads with relatively few glands, and the somewhat drooping capitulescence of *S. adenotricha*, strongly suggests that an influx of genes from *S. klattii* has occurred. Finally, both *S. klattii* and *S. liebmannii* occur in the region of the type locality of *S. adenotricha*, thus the occasional hybrid or introgressant might be expected.

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A NEW EPIPHYTIC SPECIES OF *SENECIO* (ASTERACEAE: SENECEONEAE)
FROM VERACRUZ, MÉXICO

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ABSTRACT

The genus *Nelsonianthus* was recently proposed to accommodate its only described species, *N. epiphyticus*, which occurs in Guatemala and adjacent Chiapas, México. The genus would appear to be a segregate from the sect. *Terminales* of *Senecio*, sensu Greenman, a position essentially adopted by Barkley (1985). If accepted, the genus *Nelsonianthus* is now known by an additional species, *S. tapianus*, described here from near Xalapa, Veracruz, México.

KEY WORDS: *Nelsonianthus*, *Senecio*, Senecioneae, Asteraceae, México.

The epiphytic species, *Nelsonianthus epiphyticus* H. Robins. & Brettell, was first described by Robinson & Brettell (1973). Williams (1974) transferred this to the genus *Senecio*, where it was dubbed *S. armentalis* L. Williams (the name *S. epiphyticus* O. Ktze. being occupied). Barkley (1985) would include the species in his broad view of *Senecio*, a position which I follow here.

Senecio tapianus is readily distinguished from *S. armentalis* by its radiate heads and more numerous disk florets with shorter corollas.

Senecio tapianus B. Turner, *spec. nov.* (Figure 1). TYPE: MÉXICO. Veracruz: Mpio. Chiconquiaco, "Cima del Cerro del Borrego, entre planta del Pie y Buenavista. Bosque de Niebla suelo arcilloso con abundante materia organica asociada con *Quercus* spp." 21 Jan 1988, L. Tapia M. & J. Hernández P. 517 (HOLOTYPE: TEX!: Isotype: WIS).

S. armentalis similis sed foliis plerumque cordatis vel triangularibus petiolis longioribus, capitulis radiatis, et flosculis disci numerosioribus (15-20 vs ca 10) corollis brevioribus (ca 7 mm longis vs 10 mm) differt.

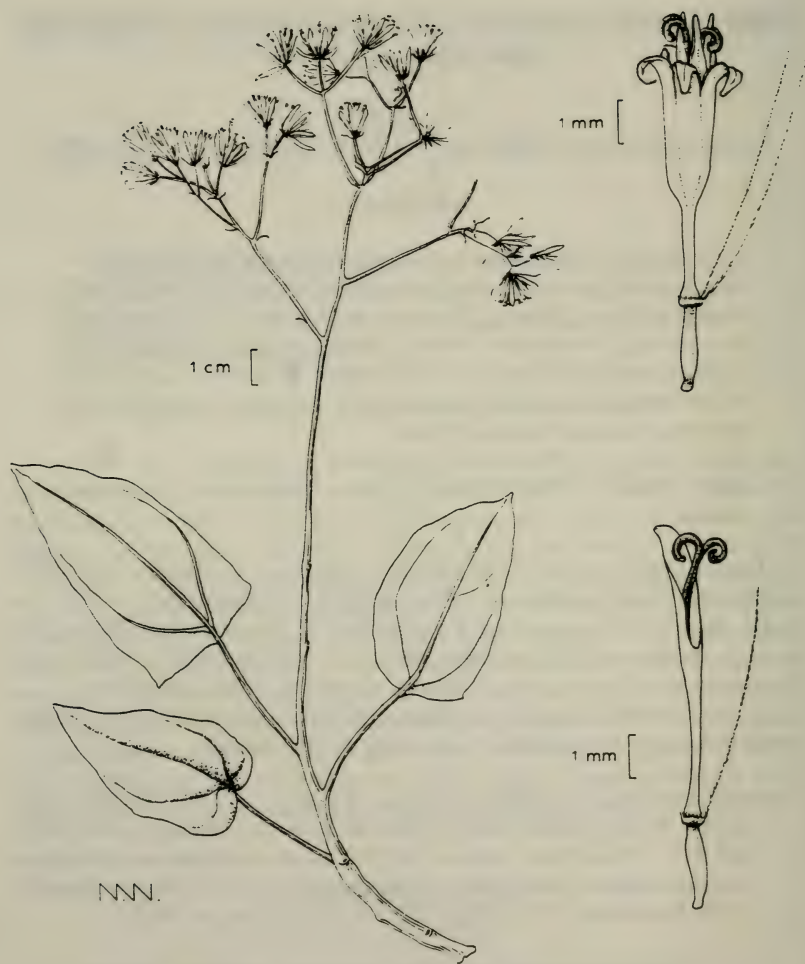


Fig 1. Senecio tapianus, from isotype.

Epiphytic sarcocaulous herb or shrublet 20-50 cm high. Leaves mostly alternate, 8-12 cm long, 3-4 cm wide; petioles 2.5-3.5 cm long; blades broadly ovate, cordate to triangular, glabrous, trinervate from or near the base, the margins entire. Heads 20-30, borne terminal in an open cymose panicle, the primary peduncles glabrous, 6-12 cm long, the ultimate peduncles 0.5-1.5 cm long. Involucres 8-9 mm high, the linear lanceolate bracts 8, glabrous, equal, these subtended by (0)1-3 linear, calyculate bracts 1-3 mm long. Receptacle convex, ca 2 mm across, glabrous, epaleate. Ray florets 5, pistillate, fertile; ligules yellow, 2-3 mm long, ca 1 mm wide; tubes ca 4 mm long. Disk florets ca 20; corollas yellow, glabrous, ca 7 mm long, the tube ca 3.5 mm long, the throat ca 3 mm long, the lobes ca 0.5 mm long. Achenes ca 3 mm long, glabrous.

According to label data, the florets are yellow and the plant is said to be a "muy abundante epiphyte" at the locality concerned.

It is a pleasure to name this taxon for its principal collector who called it to my attention by letter, dated 11 Dec 1987, accompanied by a colored photograph of the plant. From the latter, I recognized its relationship to *Nelsonianthus epiphyticus* (= *Senecio armentalis*). Subsequently, examining pressed plants made by Mr. Tapia, I concluded that these represented an undescribed species and take great pleasure in naming this for its major collector, astute plant systematist who works out of INIREB, Xalapa (XAL).

ACKNOWLEDGMENTS

I am grateful to Luis Tapia M., who first called the plant to my attention (as noted above), and to Dr. Guy Nesom for the Latin diagnosis and to him and T. Barkley for comments upon the manuscript itself. Nancy Webber provided the illustration.

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NEW SPECIES, NAMES AND COMBINATIONS IN *SENECIO*, SECT.
PALMATINERVII (ASTERACEAE)

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ABSTRACT

Preparation of a treatment of the genus *Senecio* of the Asteraceae for México has necessitated description of one new species, *S. carlomasonii* B. Turner & T. Barkley, and five new specific combinations: *S. cronquistii* (H. Robins. & Bret.) B. Turner & T. Barkley; *S. gentryi* (H. Robins. & Bret.) B. Turner & T. Barkley; *S. michoacanus* (B.L. Robins.) B. Turner & T. Barkley; *S. subcymosus* (H. Robins.) B. Turner & T. Barkley, and one new name, *S. octobracteatus* B. Turner & T. Barkley. All of these belong to the sect. *Palmatinervii* of *Senecio*, sensu T. Barkley (= *Roldana* sensu H. Robinson & Brettell). In addition one new varietal combination under *S. octobracteatus*, *S. o. var. durangensis* (H. Robins. & Bret.) B. Turner & T. Barkley is proposed.

KEY WORDS: *Senecio*, Senecioneae, Asteraceae, México.

Preparation of a treatment of the tribe Senecioneae for México by the present authors has necessitated publication of the following species, names and new combinations in *Senecio*. All of the taxa belong to the sect. *Palmatinervii* of *Senecio* (sensu Barkley 1985) or to the genus *Roldana*, (sensu Robinson & Brettell 1974).

NEW SPECIES

Senecio carlomasonii B. Turner & T. Barkley TYPE: MÉXICO. Sonora: "along the road between Yapachic and Yecora, 19 mi W of the border with Chihuahua. dry, rocky hillside. with oaks," 24 Sep 1984, *Scott Sundberg 2839* (HOLOTYPE: TEX; Isotype: MEXU).

Senecio hartwegii Hemsl. similis sed bracteis involucralibus 10-13 (vs 5-8) et foliis glabratis vel fere glabratis in paginis infernis.

Suffruticose perennial herbs or subshrubs to 2.5 m high. Stems terete, puberulent to glabrate, purple or purple-maculate. Mid stem leaves alternate, 10-20 cm long overall, 6-12 cm wide; petioles 2-8 cm long, puberulent to glabrate; blades broadly oval (somewhat wider than long) to elliptic-ovate (longer than broad), sparsely puberulent beneath to glabrous, 5-9 palmately nervate from or near the base, the margins with 9-13 shallow lobes. Heads radiate, numerous in a pyramidal-corymbose capitulescence, the ultimate peduncles puberulent (glabrate with age), mostly 3-10 mm long. Involucres narrowly campanulate, 4-6 mm high, the bracts 10-13, glabrous or nearly so, the calyculus of 3-6 short, linear, bracts. Ray florets mostly 5, the ligules yellow, 3-4 mm long. Disk florets 10-20, the corollas yellow. Achenes broadly fusiform, ca 2 mm long, decidedly short pubescent throughout, the pappus of numerous, white, readily deciduous bristles 4-6 mm long. Chromosome number, $n = 30$ pairs (*Sundberg 2839*, the holotype).

Additional Specimens Examined: MÉXICO. Sonora: Sierra Charuco, 11 Oct 1935, *Gentry 2034* (TEX). Chihuahua: ca Cascada de Basaseachic, 1800-2050 m. 17-20 Oct 1986. *Nesom & Vorobik 5575* (TEX); Yapachic, 18 Sep 1971, *Pennington 126* (TEX); 19.5 mi W of Madera, 22 Sep 1984. *Sundberg & Lavin 2800* (TEX). Sinaloa: ca Surutato, 1600-1800 m, 11 Dec 1987, *Vega A., et al. 2576* (TEX). Nayarit: 5.5 mi SW of Jalisco, road to El Malinal, 1300 m, 14 Nov 1959, *McVaugh & Koelz 652* (LL,MICH).

This species has long been placed within the fabric of *Senecio hartwegii*, a taxon with fewer, broader involucre bracts (5-8 in number vs 10-13), arachnoid tomentose stems and undersurfaces of leaves rather evenly soft tomentose throughout. McVaugh (1984) notes that *S. hartwegii* Benth. and *S. seemannii* Greenm. are synonymous (with which we agree), but he comments that Greenman applied the name *S. seemannii* "to rather similar but nearly glabrous plants, probably belonging to more than one species." McVaugh was perceptive in this observation, for Robinson & Brettell (1974) have correctly removed *S. octobraceatus* (as *Roldana pennellii* Robins. & Bret.) from the umbrella of Greenman's *S. seemannii* and we here describe *S. carlomasonii*, also removed from that species. *Senecio octobraceatus* is readily distinguished from both *S. hartwegii* and *S. carlomasonii* by its glabrous achenes. The latter is readily distinguished from *S. hartwegii* by its more numerous (10-13), linear-lanceolate, involucre bracts. *Senecio hartwegii*, so far as known, is confined to the regions of southern Durango, Nayarit and adjacent Jalisco (the type being from the region of Bolanos, Jalisco). *Senecio carlomasonii* is more widespread, occurring from Nayarit northwards to southern Arizona in the United States, where the species has long been called *S. hartwegii*.

It is a pleasure to name this species for Dr. Charles Mason, longtime Professor and Director of the Herbarium (ARIZ) at the University of Arizona, Tucson.

NEW NAMES AND COMBINATIONS

Senecio octobracteatus B. Turner & T. Barkley, *nom. nov.* Based upon *Roldana pennellii* H. Robins. & Bret., *Phytologia* 27:422. 1974. Not *Senecio pennellii* Greenman (1923).

As noted by Robinson & Brettell (1974), this species is closely related to *S. hartwegii*, the latter possessing 10-13 involucre bracts, pubescent achenes and having a different regional distribution. They also recognize infraspecific categories under this species with the description of var. *durangensis*, as do we. The latter is readily distinguished from var. *octobracteatus* by its 5 involucre bracts and more southwestern distribution.

Senecio octobracteatus var. *durangensis* (H. Robins. & Bret.) B. Turner & T. Barkley, *comb. nov.* Based upon *Roldana pennellii* var. *durangensis* H. Robins. & Bret., *Phytologia* 27:423. 1974.

Senecio cronquistii (H. Robins. & Bret.) B. Turner & T. Barkley, *comb. nov.* Based upon *Roldana cronquistii* H. Robins. & Bret., *Phytologia* 27:417. 1974.

Senecio gentryi (H. Robins. & Bret.) B. Turner & T. Barkley, *comb. nov.* Based upon *Roldana gentryi* H. Robins. & Bret., *Phytologia* 27:418. 1974.

Senecio michoacanus (B.L. Robins.) B. Turner & T. Barkley, *comb. nov.* Based upon *Cacalia michoacana* B.L. Robins., *Proc. Amer. Acad. Arts* 43:46. 1907.

Senecio subcymosus (H. Robins.) B. Turner & T. Barkley, *comb. nov.* Based upon *Roldana subcymosa* H. Robins., *Phytologia* 32:332. 1975.

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We are grateful to Guy Nesom for the Latin diagnosis and for reviewing the manuscript.

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NOTES ON THE FLORA OF TEXAS WITH ADDITIONS, RANGE EXTENSIONS AND ONE CORRECTION

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ABSTRACT

The alien plants *Macfadyena unguis-cati*, *Ottelia alismoides*, *Zeuxine strateumatica*, *Cyrtomium falcatum*, *Sageretia thea*, *Bacopa repens* and *Pilea microphylla* are documented as escapes in Texas. New Texas collections are given for the adventives *Senecio vulgaris*, *Phyllanthus urinaria*, *Bellardia trixago* and *Kallstroemia mazima*. Information is provided to demonstrate that *Hypericum fasciculatum* does not occur in Texas.

KEY WORDS: Floristics, Texas, aliens, weeds.

Shinners (1965) chided American taxonomists for a lack of serious attention to weedy, adventive plants. He noted that studies of weedy plants have much to tell us about evolution, phytogeography and origins of cultivated plants. In this light, the present paper is devoted to a discussion of some recently discovered adventive and potentially weedy plants in Texas. Also included are Houston area records for some rare adventive plants previously recorded elsewhere in the state. Information is also given to show that *Hypericum fasciculatum* does not occur in Texas.

In addition, the authors were involved with a new revision of the Texas Agricultural Experiment Station publication: Texas Plants—A Checklist and Ecological Summary. Here we provide the data to support the inclusion of some plants listed as new to Texas in that forthcoming publication.

All collections cited in this paper are deposited in the Spring Branch Science Center Herbarium (SBSC) in Houston, Texas. Duplicates of most collections are also at SMU, TEX or TAES.

ASTERACEAE. *Senecio vulgaris* L. Harris Co.: sidewalk weed in Alabama Shopping Center on S. Shepherd Street in Houston, 25 Jun 1987, *Brown 11200*. A native of Eurasia and present in North America as a ruderal weed. Lipscomb (1978) reported it from Dallas and Wichita cos. This Harris Co. collection and

one from New Orleans, Louisiana (Gandhi & Thomas in press) are probably the most southern in the United States.

BIGNONIACEAE. *Macfadyena unguis-cati* (L.) Gentry. Fort Bend Co.: a large naturalized population in and along Hoot's Holler Nature Trail in Brazos Bend State Park, 19 Jul 1989, *Lewis s.n.* This relatively large population formed a dense mat over the ground, and some stalks were climbing nearby tree trunks. Kay Lewis and Frank Gregg of the Houston Outdoor Nature Club discovered this population during a vascular plant survey of the park. Lynn Lowrey identified the sterile collection as *Doxantha* but Gentry (1973), noting the similarities of *Doxantha* and *Macfadyena*, submerged the single species of *Doxantha* under the older name.

EUPHORBIACEAE. *Phyllanthus tenellus* Roxb. Harris Co.: frequent weedy plant in pots in Anderson Nursery at 2222 Pech Rd in Houston, 25 Jul 1989, *Brown 14001*. Johnston (1988) reported this as present in Galveston and Chambers cos. According to Webster (1970), it is native to the Mascarene Islands and was introduced into Florida about 1920. By about 1970, Webster had found no collections from either Louisiana or Texas. It was included in a 1979 thesis on the vascular flora of Rapides Parish, Louisiana (MacRoberts 1984) and Thomas (personal communication 1989) reports collections at NLU from Lafayette and Orleans parishes. This weed has apparently spread from Florida throughout the Southeast via the commercial trade in nursery stock.

Phyllanthus urinaria L. Harris Co.: common weedy plant on moist soil adjacent to building of Northwest Campus of the Houston Community College, 25 Nov 1986, *Brown 10809*; Colorado Co.: flower bed of Stuckey's restaurant ca 1 mi west of Interstate 10 bridge over the San Bernard River, 29 Oct 1983, *Brown 6820*. Correll & Johnston (1970) list it only for Jefferson Co., but it is now a somewhat frequent weed on sandy roadsides in the pineywoods and in gardens and near buildings in cities. It is present west to Houston and with a few records to the west of the city. As in *P. tenellus*, its dispersion has probably been aided by the transport of nursery stock.

HYDROCHARITACEAE. *Ottelia alismoides* (L.) Pers. Jefferson Co.: common aquatic in J.D. Murphree Wildlife Management Area in Port Acres, 9 Sep 1988, *Brown, Neville, Stutzenbaker 13142*. Correll & Johnston (1970) report this Asian aquatic from Cameron Parish, Louisiana and it is likely to appear in Texas. However, C.D. "Stutz" Stutzenbaker, wildlife biologist at this management area, has an herbarium specimen collected in 1966 at the J.D. Murphree site. Thomas (personal communication 1989) cites additional Louisiana collections from Sabine and Calcasieu parishes.

HYPERICACEAE (CLUSIACEAE). *Hypericum fasciculatum* Lam. Reports of this shrub as native in Texas are in error. Although listed for the state in Correll & Johnston (1970) and by Johnston (1988), Adams (1973) gives the range as west only to St. Tammany Parish, Louisiana and Godfrey & Wooten (1981) report it west to south Mississippi. In the spring of 1989,

the senior author had the opportunity to collect what we believe is authentic material of *H. fasciculatum* in Liberty Co., Florida. The robust size of these Florida plants is remarkable when compared to similarly identified shrubs in Texas. An examination of herbarium specimens at SMU revealed that all of the Texas sheets labeled as *H. fasciculatum* are actually *H. galioides* Lam. According to Adams (1973), *H. galioides* is present in west Louisiana and east Texas as only narrow leaved shrubs. Texas workers are identifying these narrow leaved plants as *H. fasciculatum*. Since existing keys are not adequate to distinguish narrow leaved *H. galioides* from *H. fasciculatum*, we offer the following as a possible solution:

- a. all leaf margins tightly revolute, thus leaving only the midrib vein visible on the lower surface; sepals 6-8 mm long *H. fasciculatum*
- a' most leaves with margins tightly revolute with only the midrib vein visible, but many others revolute only near the margins and thus with some portion of the flat lower surface visible; sepals 3-5 mm long *H. galioides*

ORCHIDACEAE. *Zeuxine strateumatica* (L.) Schlechter. Montgomery Co.: in yard at 2418 Trail River Drive in Kingwood, 19 Jan 1988, *Gudrum Opperman s.n.* Steve Young, botanist at Mercer Arboretum, brought a collection of a winter flowering orchid to the Spring Branch Science Center for identification. With the aid of Luer (1972), it was identified as this introduced Asiatic species. In the United States, it appears to be common only in peninsular Florida where Wunderlin (1982) lists it on open, grassy, disturbed sites. Clewell (1985) reports it only for Franklin Co. in cooler northern Florida. The western limits were in Louisiana with specimens from Jefferson and Plaquemines parishes (Pridgeon & Urbatsch 1977). Young (personal communication) saw an increased number of plants at this Montgomery Co. site in January 1989.

POLYPODIACEAE. *Cyrtomium falcatum* (L.f.) Presl. Harris Co.: naturalized plants on bank of Langham Creek N of Clay Road in Addicks Reservoir, W of Houston, 13 Mar 1988, *Brown & Young 11999*. Thieret (1980) mapped specimens of naturalized Asian Holly Fern from eight Louisiana parishes.

RHAMNACEAE. *Sageretia thea* (Osbeck) M.C. Johnston. Brazoria Co.: highway 35, ca 4 mi S of Alvin, 25 Jun 1988, *Brown & Lowrey 12200*; Brazoria Co.: common roadside shrub along highway 1462, 2.8 mi W of intersection with highway 409 in Alvin, 19 Jul 1989, *Brown 13998*. An Asiatic shrub forming hedges between highways and adjacent fields near Alvin. Lynn Lowrey (personal communication 1989) claims that the state highway department at one time planted pauper's tea along some highways. R. Dale Thomas identified a sterile collection as a *Sageretia* and it matched herbarium material of cultivated *S. theezans* (L.) Brong. at SBSC. However, Marshall C. Johnston

(personal communication 1989) indicates *S. thea* to be the correct name for this species.

SCROPHULARIACEAE. *Bacopa repens* (Sw.) Wettst. Waller Co.: in water of rice field adjacent to highway 2855, just N of intersection with highway 90, between Katy and Brookshire, 17 Aug 1986, *Brown 10662*. This tropical American aquatic was previously known in the United States from the vicinity of Rice Experimental Station in Butte Co., California (Barrett & Strother 1978), in Georgetown Co., South Carolina, and from nine parishes in south Louisiana (Thieret 1970 and personal communication from R. Dale Thomas 1989). The Texas locality is a private commercial rice field, although not far from a rice experiment station.

Bellardia trixago (L.) All. Harris Co.: two small plants in grassy area adjacent to Interstate 10 between Houston and Katy, 22 Apr 1989, *Brown 13451*. This Old World species has been adventive in California since the turn of the century and it was found in Navarro Co., Texas in 1980 (Lipscomb & Ajilvsgi 1982).

URTICACEAE. *Pilea microphylla* (L.) Liebm. Harris Co.: lawn weed at 6218 Doliver Street in Houston, 10 Sep 1988, *W.L. McClure s.n.* Wunderlin (1982) reports artillery plant as frequent in central Florida; Clewell (1985) cites collections only from Leon and Gadsden cos. in northern Florida; and Darwin, *et al.* (1981) report it as a common ruderal on the Tulane University campus in New Orleans, Louisiana. The Harris Co. plants are probably adventive from nursery stock since artillery plant is said to be a common greenhouse weed.

ZYGOPHYLLACEAE. *Kallstroemia maxima* (L.) Hook. & Arnott. Harris Co.: weedy in parking lot of Fonde Recreation Center in downtown Houston, 10 Oct 1984, *Brown 8160*; Austin Co.: sandy bottomland of Mill Creek near highway 159, bridge west of Bellville, 27 Sep 1987, *Brown 11613*. Its United States distribution includes Florida, Georgia, South Carolina, Pennsylvania and Texas. Porter (1970) considers it native to the Caribbean area and to have arrived in the United States via ship's ballast. The above two collections appear to be the first in Texas since the 1934 Lehmann collection (at TEX, GH) from Washington Co. (Porter 1969). The senior author has noted plants at the Houston site each year since the first collection.

ACKNOWLEDGMENTS

We wish to thank R. Dale Thomas, Marshall C. Johnston and Lynn Lowrey for help in identifying some of these plants. We also thank Barney Lipscomb for courtesies extended in visits to SMU. Publication costs were met from a Community Service Award to the senior author from the Bedichek Faculty Development Fund at Houston Community College. We also thank Paul A.

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A NEW SPECIES OF *AGERATINA* (ASTERACEAE: EUPATORIEAE) FROM
CHIMALAPA, OAXACA, MÉXICO

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ABSTRACT

Ageratina chimalapana, a new species from Oaxaca, México, is described and illustrated. Because of its biseriata heteromorphic pappus and shrubby habit, it is believed to be related to the *A. mairiana* complex of México.

KEY WORDS: *Ageratina*, Eupatorieae, Asteraceae, México.

Routine identification of Mexican Asteraceae from southern México has revealed the following novelty:

Ageratina chimalapana B. Turner, *spec. nov.*, Figure 1. TYPE: MÉXICO. Oaxaca: Mpio. San Miguel Chimalapa, Cima del Cerro Salomon, al NO de Benito Juárez, ca 44 km en línea recta al N de San Pedro Tapanatepec (16° 46' 15" N, 94° 11' 45" O), 1770 m, 8 Apr 1986, *M. Ishiki 1455* (HOLOTYPE: TEX!; Isotype CHAPA!).

A. ligustrinae (DC.) King & H. Robins. similis sed caulibus et foliis ubique glabris, laminis foliorum 3-nervatis crassis, et pappo biseriato, series interior series exterior 4-5-plo longa differt.

Shrub or small glabrous trees 2 m high or more. Stems terete, glabrous. Leaves opposite, 6-9 cm long, 3-4 cm wide, glabrous throughout; petioles 1.5-2.0 cm long; blades ovate-elliptic, rather thick and markedly venose beneath, the margins entire. Heads numerous in rather congested terminal corymbs, the ultimate peduncles mostly 1-5 mm long. Involucres campanulate, the bracts more or less subimbricate in 3-4 series, the inner series 3.5-4.5 mm high, their margins minutely ciliate with soft hairs. Receptacles plane, glabrous. Florets 11-14 per head, the corollas white, glabrous, 4-5 mm long, the throat ca 2 mm long, grading into the tube. Achenes ca 3 mm long, cylindric, glabrous except for a few hispid hairs near the apex, the pappus in 2 series, an inner row of 20-30 white bristles 4-5 mm long and an outer row of much shorter delicate bristles 1 mm long or less.

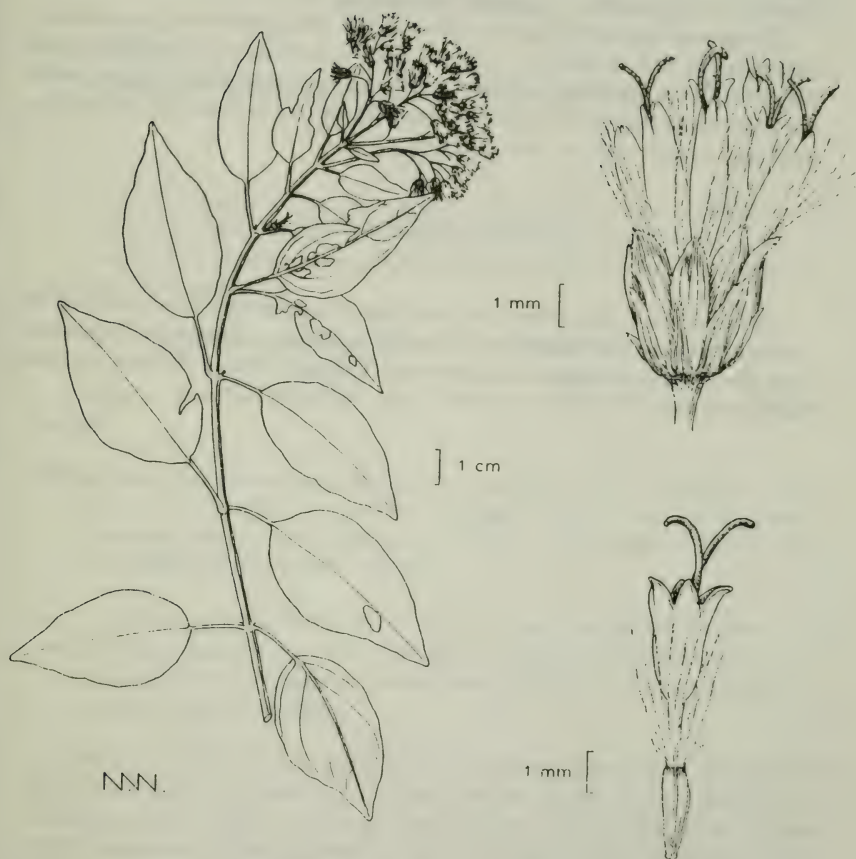


Fig. 1. *Ageratina chimalapana*, from holotype.

Ageratina chimalapana occurs in evergreen montane cloud forests, and was collected along the ridgetop of Cerro Salomon in a low forest of *Weinmannia*, *Gaultheria*, *Cavendishia*, *Rapanea*, *Liquidambar*, etc.

The present species belongs to the subgenus *Neogreenella* and superficially resembles the widespread *A. ligustrina* DC. It is readily distinguished from the latter by its glabrate condition, thick venose leaves with 3 major veins, the blade not crimped at the petiolar juncture and by its 2-seriate pappus, the outer series much shorter than the inner.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis and for a review of the manuscript itself. Dr. Tom Wendt, who has assembled a large set of collections from the Chimalapa region, also reviewed the paper. Nancy Webber provided the illustration.

A NEW SPECIES OF *PSACALIUM* (ASTERACEAE: SENECTIONEAE) FROM GUERRERO, MÉXICO

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ABSTRACT

A new species of *Psacalium* related to *P. pringlei* (= *Odontotrichum pringlei*) is described from near Chilpancingo, Guerrero, México. It is readily distinguished from related taxa in having white tomentose stems and bicolored leaves.

KEY WORDS: *Psacalium*, Senecioneae, Asteraceae, México.

Routine identification of Mexican Asteraceae has revealed the following novelty:

Psacalium guerreroanum B. Turner, *spec. nov.* TYPE: MÉXICO. Guerrero: "km 70-71 de la carretera Chilapa-Tlapa (E de Chilpancingo)," pine-oak forests, 2 Nov 1986, J.L. Panero, E.E. Schilling & B.E. Wolford 582A (HOLOTYPE: TENN).

P. pringlei (S. Wats.) H. Robins. & Bret. similis sed caulibus omnino albi-floccosis, foliis bicoloribus dense albi-tomentosis in paginis infernis, et capitulis paucioribus majoribus involucris plerumque 9-11 mm altis differt.

Perennial herbs to 1 mm high, white tomentose throughout. Basal leaves 24-28 cm long, tawny woolly at the base; petioles 10-14 cm long; blades 12-15 cm long, 6-8 cm wide, ovate in outline, bicolored, the undersurfaces densely white tomentose, principal lobes 5, these often again lobed, pinnately veined. Heads eradiate, 6-20 in open lax cymes, the primary peduncles mostly naked and up to 50 cm long, the ultimate peduncles 4-6 cm long, including the scale like bractlets. Involucres broadly turbo-campanulate, 9-11 mm high, 10-12 mm wide, the inner bracts 8, equal, elliptical, 3-5 mm wide, the margins broad and scarious, the outer surfaces tomentulose. Florets 25-35 per head, the corollas white, 8-10 mm long, the tubes ca 5 mm long, the lobes 3-4 mm long. Achenes (immature) ca 3 mm long, densely white sericeous, the pappus of numerous white barbellate bristles ca 7 mm long.

Psacalium guerreroanum, because of its densely tomentose or flocculose stems and foliage, is readily distinguished. It is clearly related to *P. pringlei*, but differs by the above mentioned vestiture, fewer and larger heads on much longer (4-6 cm) ultimate peduncles.

ACKNOWLEDGMENTS

I am grateful to Dr. E. Schilling (TENN) for the loan of material. Guy Nesom provided the Latin diagnosis and both he and Dr. A. McDonald reviewed the manuscript.

THE SUBTRIBAL AFFINITIES OF THE GENUS *TETRAGONOTHECA* (ASTERACEAE: HELIANTHEAE)

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ABSTRACT

Tetragonotheca is a North American herbaceous genus of four species traditionally placed in the tribe Heliantheae, subtribe Helianthinae, and more recently placed in the subtribe Galinsoginae. The melampolide type sesquiterpene lactones reported in *Tetragonotheca* strongly suggest that *Smallanthus* of the Melampodiinae is its closest generic ally. A comparison of morphological features of representative species offers further support for this concept.

KEY WORDS: Systematics, Asteraceae, Heliantheae, *Tetragonotheca*, North America.

Tetragonotheca as treated by Turner & Dawson (1980) comprises 4 species: *T. helianthoides* which grows throughout much of the coastal plain of the southeastern United States, and *T. ludoviciana*, *T. repanda* and *T. texana* which are endemic to or primarily occur in central or southeastern Texas. The genus is a member of the Heliantheae, but has questionable subtribal affinities. Stuessy (1977) placed *Tetragonotheca* in Helianthinae along with genera such as *Encelia* Adans., *Flourensia* DC., *Helianthus* L., *Viguiera* Kunth and yet others. Turner & Dawson (1980) noted *Tetragonotheca* to be relatively remote from any extant genus of the Helianthinae, but if it had a less specialized, multiseriate involucre, it would most likely be positioned near *Viguiera*. Robinson (1981) considered *Tetragonotheca* to be a member of subtribe Galinsoginae. Seaman (1982), after laboratory collaboration with the present authors prior to his seminal review of the sesquiterpenes of the Asteraceae, placed *Tetragonotheca* in the subtribe Melampodiinae.

All species of *Tetragonotheca* possess melampolide type sesquiterpene lactones (Figure 1) which are typical of subtribe Melampodiinae, (sensu Stuessy 1977) and these are rarely found elsewhere in the family (Quijano, *et al.* 1979; 1980; Seaman, *et al.* 1979; 1980; Seaman & Fischer 1980; Seaman 1982). Most of the Helianthinae (sensu Stuessy 1977) examined to date, other than

Tetragonotheca, have distinctive lactones of the heliangolide and germacrolide types (Figures 3 & 4). The Galinsoginae (sensu Robinson 1981) are not known to possess lactones. These observations suggest that the subtribal placement of *Tetragonotheca* is open to question. This study reviews the lactone data and examines the morphological and cytological data relative to the classification of *Tetragonotheca*.

Methods and Materials

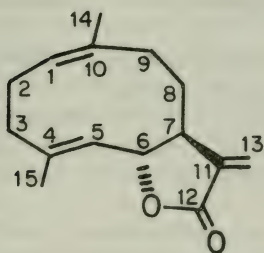
The sesquiterpene lactones of *Tetragonotheca* are reported in a series of phytochemical papers (Quijano, *et al.* 1979; 1980; Seaman & Fischer 1980; Seaman *et al.* 1979; 1980; Seaman 1982). Morphological comparisons are based on field observations, specimens preserved in FAA, herbarium specimens and data from appropriate literature. Photographs of the achenes were taken with a Wild dissecting microscope equipped with a Nikon camera. Scanning electron microscopy procedures are those given in Urbatsch & Wussow (1979) and Wussow & Urbatsch (1979).

Results and Discussion

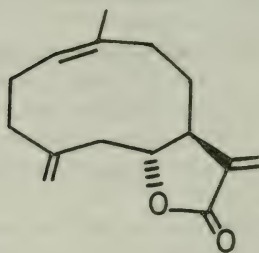
Chemical Evidence. Twenty-six sesquiterpene lactones have been isolated and characterized from *Tetragonotheca* (Quijano, *et al.* 1979; 1980; Seaman, *et al.* 1979; Seaman & Fischer 1980). The compounds are of two skeletal types, melampolides and repandolides (Figures 1 & 2). The melampolides are characterized by having a cis-, trans-cyclodecadiene skeleton; repandolides are biosynthetically modified melampolides (Seaman *et al.* 1979; Fischer *et al.* 1979).

Tetragonotheca helianthoides and *T. ludoviciana* contain only melampolides that have the same 10-membered ring skeleton but differ in their ester side chains (Quijano, *et al.* 1979; 1980; Seaman & Fischer 1980). Fifteen lactones, the highest number for the genus, have been isolated from *T. ludoviciana* (Quijano, *et al.* 1979; 1980). Fourteen of the lactones are unique to *T. ludoviciana* and the remaining, polydalin, has been previously isolated from *Smallanthus uvedalius* (Herz & Bhat 1970). Twelve of these 14 unique compounds have five-carbon ester side chains at C-8 and C-9 with hydroxyls, or their oxidative derivatives, at C-2' or C-3'; the two remaining lactones possess five-carbon esters at position C-8 but have acetates at position C-9 (Quijano, *et al.* 1979; 1980).

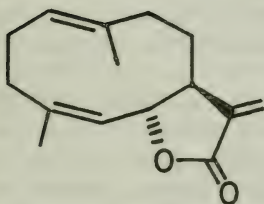
Six melampolide type lactones were detected in *T. helianthoides*, (Seaman & Fischer 1980; Seaman, *et al.* 1980). Four of these have the same skeletal type as the melampolides in *T. ludoviciana*. Of these four compounds, two contain five-carbon ester side chains at C-8 and acetates at C-9, and the other two have this same configuration with hydroxyl groups at C-15. The two remaining melampolides of this species have five-carbon esters at C-8 and C-9.



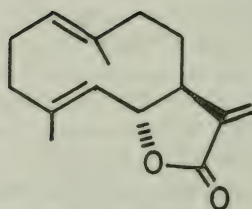
1. melampolide



2. repandolide



3. heliangolide



4. germacrolide

Figures 1-4. Types of germacranolides found in the Heliantheae. 1. melampolide. 2. heliangolide. 3. germacrolide. 4. repandolide.

Tetragonotheca repanda contains only repandolides with five-carbon ester functions at C-4 and C-8 and five-carbon ester moieties at C-9 (Quijano, *et al.* 1979). Based on thin-layer chromatographic data, *T. texana* contains the same four lactones.

The skeletal types of sesquiterpene lactones in *Tetragonotheca* are identical to those found in several genera belonging to Melampodiinae (Seaman, *et al.* 1980; Seaman & Fischer 1980). Polydalin, from *T. ludoviciana*, and longipilin, from *T. repanda*, were, in fact, first isolated from *Smallanthus uvedalius* and *Melampodium longipes* B.L. Robins., respectively (Herz & Bhat 1970; Fischer, *et al.* 1979).

The occurrence of 6,12-lactonized melampolides outside the Melampodiinae is limited to species of *Tetragonotheca*, *Enhydra fluctuans* Lour., *Blainvillea dichotoma* (Murr.) Cass. (Seaman *et al.* 1980; Seaman 1982; Bohlmann, *et al.* 1981; 1982), *Milleria quinqueflora* L. (Jakupovic, *et al.* 1987) all of the tribe Heliantheae. *Urospermum dalechampii* Schmidt (Rychlewska, *et al.* 1986) and *Lactuca sativa* L. both of the tribe Lactuceae (Mahmoud, *et al.* 1986) also possess 6,12-lactonized melampolides.

That *Tetragonotheca* is best placed in the Melampodiinae on the basis of lactone data was suggested by Urbatsch (1979) and Seaman, *et al.* (1980) where it was subsequently placed by Seaman (1982). The position of *Enhydra* Lour. remains controversial. Benthams (1873) includes it in the Melampodiinae, Stuessy (1977) transfers it to the Ecliptinae Less. and Robinson (1981) places it in the monogeneric Enhydrinae H. Robinson. Seaman, *et al.* (1980) notes that *Enhydra* might fit well in the Melampodiinae, but deferred a decision until data from more than one species becomes available. The skeletal types of lactones found in one species of *Blainvillea* Cass. are similar to those in *Tetragonotheca*, but the two differ in the types of sidechains; aldehyde substituent groups characterize the former and carbomethoxy groups characterize the latter and the Melampodiinae (Bohlmann, *et al.* 1981; Fischer, *et al.* 1979; Seaman 1982). Stuessy (1977) and Robinson (1981) regard *Blainvillea* to be in Ecliptinae, even though its lactone chemistry is quite different from that known for the subtribe. Further investigation of its disposition is suggested by the chemical data.

The occurrence of melampolides in *Milleria quinqueflora* of subtribe Milleriinae Benth. & Hook. supports its close phyletic position with the Melampodiinae (Jakupovic, *et al.* 1987). Except for *Milleria*, there is complete disagreement on the generic composition of the Milleriinae as proposed by Stuessy (1977) and Robinson (1981), the two most recent investigators of the group. Stuessy places three of the six genera of Robinson's (1981) Milleriinae in the Melampodiinae and Robinson places one genus of Stuessy's Melampodiinae in the Milleriinae.

Melampolides from *Lactuca* and *Urospermum* (subtribe Lactuceae) are very similar to those found in the Melampodiinae/Milleriinae complex, but differ in not being substituted at C-8 (Mahmoud, *et al.* 1986; Rychlewska, *et al.* 1986). Their presence in such remotely related taxa (tribe Lactuceae) is undoubtedly due to convergence and clearly points to the need to use biochemical data in concert with other sorts of information in making systematic judgments.

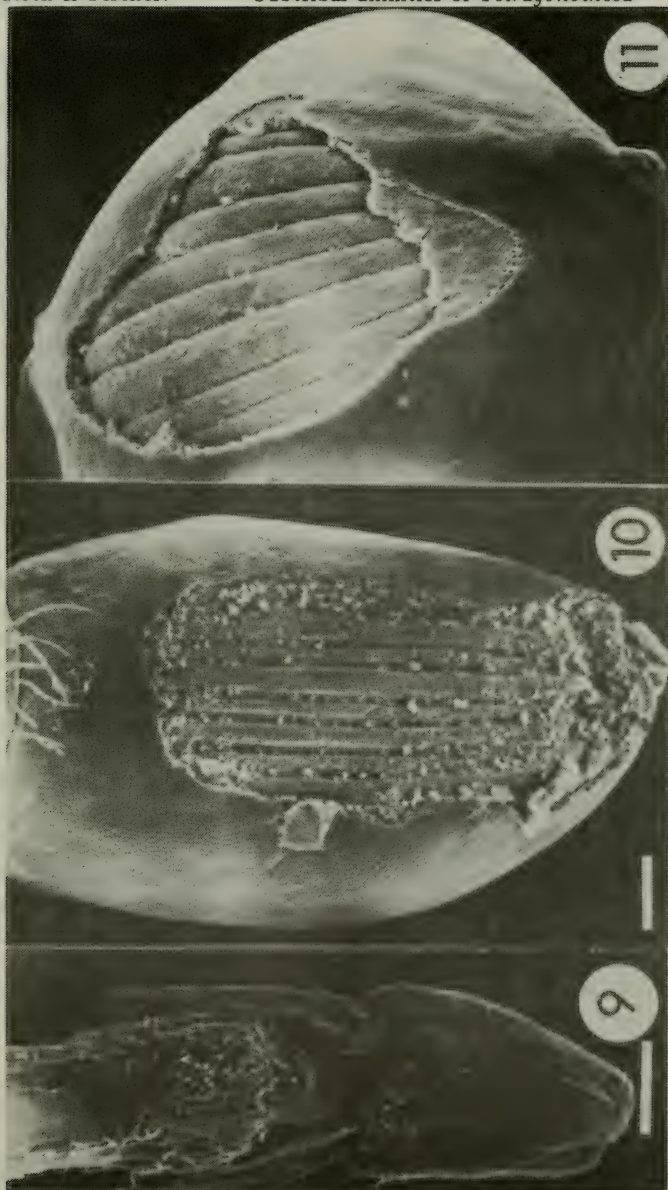
Melampolides lactonized in the 8,12 configuration have been isolated from *Iva frutescens* L. (Herz, *et al.* 1972) and *Schkuhria schkuhrioides* Thell. (Stewart & Mabry 1985), which are treated by Robinson (1981) as members of Ambrosiinae Less. and Chaenactidinae Rydb., respectively. Little is known about the biosynthesis and genetic basis for the various lactones. Nevertheless, differences between compounds of the latter two taxa and the ones producing the 6,12-lactonized melampolides probably have a genetic basis, making them useful phylogenetic markers.

The lactone data tend to reject previous suggested affiliations of *Tetragonotheca* with such genera as *Viguiera*, *Tithonia*, *Encelia* and *Helianthus* (Stuessy 1977), which produce heliangolides and germacrolides, and with genera of the Galinsoginae (Robinson 1981), which are not known to possess lactones. Because the lactone data strongly suggest that *Tetragonotheca* may be allied to the Melampodiinae, we undertook this evaluation of the morphological criteria relative to its classification.

Morphological Evidence. *Tetragonotheca* shares some features with Helianthinae (sensu Stuessy 1977) including yellow rays, hermaphroditic disc flowers, and base chromosome numbers of $x = 17$ (Turner & Dawson 1980). However, the majority of morphological features, together with the lactone data, argues for excluding *Tetragonotheca* from the Helianthinae. The leaves and inflorescence bracts of *Tetragonotheca* are mostly opposite (upper leaves and bracts alternate in *T. repanda*) and its petioles encircle the stem, its involucre is biseriate, the outer phyllaries are four in number, broad and herbaceous, the inner series resemble the receptacular bracts, and each closely subtends a ray achene (Figure 5). Helianthinae typically have alternate leaves above and mostly narrow leaf bases, multiseriate involucre and numerous, narrow phyllaries with the inner ones not uniformly corresponding with the rays and not enclosing their achenes (Figures 6 & 7). Rays in the Helianthinae are usually neuter; whereas, *Tetragonotheca* has fertile rays (Figure 5) similar to those found in *Smallanthus* (Figure 8). When present, the pappus of most Helianthinae is often caducous and generally consists of two relatively large awns or scales sometimes with smaller intermediate scales (Figure 9). *Tetragonotheca* usually lacks pappus or when present (such as in *T. ludoviciana*), it consists of numerous, readily deciduous small scales of one size class. Achenes are usually compressed in Helianthinae and prismatic to cylindric in *Tetragonotheca* (Figures 9 & 10).



Figures 5-8. Morphological features of species in *Tetragonothecca*, *Smallanthus* and *Helianthus*. 5. Flowering head of *T. helianthoides* (Urbatsch 2750 LSU) showing biseriate involucre; "a" large outer phyllaries; "b" inner phyllaries associated with ray florets. Scale markers = 5 mm for figures 5 and 6. 6. Flowering head of *H. simulans* (Urbatsch et al. 2698 LSU) showing multiseriate involucre. 7. Ray flower of *H. simulans* with subtending associated planar phyllary. Scale markers = 1 mm in figures 7 and 8. 8. Flowering head of *S. uedalius* (Fischer & Wülzer 139 LSU), "c" outer phyllaries; "d" inner phyllaries associated with ray florets.



Figures 9-11. Achenes of *Helianthus*, *Tetragonotheca* and *Smallanthus*. 9. Ovary of disc flower of *H. simulans* showing somewhat flattened achenes, pappus, and typical corolla base. Scale marker = 1 mm. 10. Immature ray achenes of *T. helianthoides* with part of the fleshy covering removed showing striations underneath. Scale markers = 0.5 mm in figures ten and eleven. 11. Immature ray achenes of *S. uvedalius* showing fleshy covering and striations.

Although *Tetragonotheca* resembles the Galinsoginae (sensu Robinson 1981) in such features as opposite leaves, fertile rays and hermaphroditic disc flowers, these similarities may not offer a strong case for a close relationship. *Tetragonotheca* differs in involuclral and paleae features; its leaves and corolla tubes possess globular trichomes along with uniseriate ones; it has yellow rays; a deciduous pappus or none at all; and a different base chromosome number $x = 17$ vs 4, 8, or 9 (Robinson, *et al.* 1981). The Galinsoginae (sensu Robinson 1981) are not known to produce sesquiterpene lactones. They rarely have clasping leaves and their leaf trichomes usually consist of uniseriate arcuate hairs. They possess coriaceous or sometimes herbaceous outer phyllaries which are usually subimbricate in two to five series and narrowly lanceolate, often trifid paleae that do not enclose the achenes. Rays in the Galinsoginae are white often with cyanic tinges; disc flowers are hermaphroditic; uniseriate hairs are generally present on the corolla tubes; and pappus scales are usually persistent.

Our investigations suggest that *Tetragonotheca* is similar to *Smallanthus* not only in terpene chemistry but also in morphology. *Smallanthus* has been included in Melampodiinae by both early and modern synantherologists (Bentham 1873; Hoffmann 1890; Stuessy 1977; Robinson 1981; Wells 1965). Features generally diagnostic for the subtribe include opposite leaves, biseriate or pluriseriate involuclres composed of broad outer herbaceous phyllaries and paleae-like inner phyllaries partially or completely enclosing the achenes, and fertile rays (Stuessy 1972, 1977; Robinson 1981). The Melampodiinae sensu Robinson (1981) includes only genera with staminate disc flowers. Stuessy (1977) includes some genera in the subtribe, e.g. *Rumfordia* DC. and *Siegesbeckia* L., with hermaphroditic disc flowers.

Species of *Tetragonotheca*, *Smallanthus* and other Melampodiinae have opposite leaves (in *T. repanda* the upper leaves may be alternate) and opposite inflorescence bracts with clasping bases. In *Tetragonotheca* the outer series of the biseriate involuclre consists of four broad herbaceous phyllaries and the inner series is paleae-like. Each inner bract subtends and partially encloses a ray achene, a characteristic also seen in *Smallanthus*. The latter generally has five outer phyllaries that may be arranged in two series (Figure 8). Corolla tubes of the disc flowers in *Tetragonotheca*, *Smallanthus* and many Melampodiinae have spreading, uniseriate hairs and capitate trichomes. Ray achenes in *Smallanthus* and the ray and disc achenes in *Tetragonotheca* are all fertile and epappose (except for *T. repanda* which frequently has a pappus of numerous small scales). Also, achenes of the two genera are virtually identical in possessing a pericarp composed of a fleshy, loosely attached outer layer and a hard, longitudinally grooved inner layer, a condition seen in other genera in the Melampodiinae (Figures 9, 10 & 11).

The hermaphroditic disc flowers of *Tetragonotheca* represent a major difference between it and *Smallanthus* and of many other species in Melampodiinae which traditionally has been characterized as having disc flowers that produce

only pollen. Recent investigators have tended to de-emphasize the diagnostic importance of this character by transferring genera with hermaphroditic disc flowers (e.g. *Rumfordia*, *Aziniphyllum* Benth. and *Siegesbeckia* L.) to the Melampodiinae (Sanders 1977; Stuessy 1977; Turner 1978a; 1978b). As Turner (1978a) suggests, perhaps excessive reliance has been accorded the sterile disc condition because closely related species in *Siegesbeckia* may possess either male fertile or bisexual disc flowers. McVaugh & Anderson (1972) and McVaugh & Laskowski (1972) note that this single character notwithstanding, *Rumfordia*, *Siegesbeckia*, *Polymnia* (including *Smallanthus*) and *Trigonospermum* may form a natural group because of their numerous similarities. Even though Robinson's Melampodiinae (1981) includes only taxa with fertile rays and sterile disc flowers, he too questions the reliability of this feature, and indeed, genera in his Milleriinae possess both conditions. The previously mentioned investigators have characterized the Melampodiinae as having disc flowers with fused style branches. Except for being smaller in size, we have observed the disc flower style branches of *Smallanthus uvedalius* to be divided and similar in form to those in *Tetragonotheca*.

Cytological Evidence. The haploid complement of $n = 17$ for *Tetragonotheca* does not coincide with the proposed base chromosome numbers of $x = 10$ and 15 (Stuessy 1977) and $x = 5$ and 6 (Turner 1978a) for the Melampodiinae. However, the diversity of chromosome numbers reported for *Smallanthus* ($n = 16, 17, 18$ and higher) and additional numbers of $n = 9, 10, 11, 12, 19$, etc. for other Melampodiinae (Stuessy 1977) suggests a possible ancestral aneuploid origin for the *Tetragonotheca* genome.

Tetragonotheca is similar to *Smallanthus* of the Melampodiinae in several chemical and morphological features. The occurrence of the unusual melampolide lactones has supported our question of the association of *Tetragonotheca* with genera of the Helianthinae and the Galinsoginae. Chemical approaches represent a powerful tool in systematic investigations (Bendz & Santesson 1973) especially when used in concert with data from other sources. In this case, chemical data lead to expansion and refinement of our morphological investigations, and suggested a more natural classification for the taxa in question.

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COCCOLOBA CARAVELLAE, SPECIES NOVA (POLYGONACEAE) IN
MARTINICA COLLECTA

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ABSTRACT

One new species of Martinique is described: *Coccoloba caravellae* (Polygonaceae). Comparisons are made with allied species *C. uvifera*, *C. pubescens* and *C. rugosa*.

KEY WORDS: *Coccoloba*, Polygonaceae, Martinique, systematics.

In pulchra insula Martinica, in peninsula Caravella, arbor generis *Coccoloba* sect. *Eucoccoloba* Lindau, ignota erat. Ergo, illam nominamus *Coccolobam* "caravellae."

Coccoloba caravellae Sastre et Fiard, *spec. nov.* TYPUS: MARTINIQUE: Presqu'île de la Caravelle, Baie Gros Raisin, en arrière-mangrove, 24 VII 1989, *C. Sastre, J.P. Fiard & C. Jeannet 8782* (cum floribus) [HOLOTYPUS: P!; Isotypus: GH!, GUA! (Herbarium INRA, Guadeloupe), MAR! (Herbarium Galerie de Botanique, F. de F., Martinique), US!.

Paratypus: MARTINIQUE: Ibid. (eadem arbor), 11 IX 1988, *C. Sastre & J.P. Fiard 8603* (cum fructibus) (GUA, MAR, P); Presqu'île de la Caravelle, Baie du Trésor, en bordure de mangrove, 30 VII 1989, *C. & F. Sastre 8800* (P).

A *C. uvifera* L., cortice fissurato, nervis I et II pilosis (non glabris) pagine superiore, hirsutis (non velutinis) pagine inferiore, inflorescentia saepe erecta, 15-30 cm, floribus virescentibus, sepalis pilosis, differt.

A *C. pubescenti* L., nervatione non omnino impressa (atque *C. uvifera* et pilosa, foliis basi profunde cordatae lobis basalibus imbricatis, pedunculis floralibus 3-4 mm longis, differt.

A *C. uvifera* et *C. pubescenti*. bostribus media minus numerosis, staminibus fertilibus sterilibusque inclusis 1 mm longis, styli 1.5 mm longis, differt.

Frutex procerus vel arbor 3-10 m alta, juvenis ramis pilosis rutilis; lenticellae nigrae; cortex fissuratus. Juvena folia rubra, folia sub-sessilia; petiolus pilosus crassus 5-10 mm longus; lamina coriacea, amplissima. 20-30 x 25-35 cm, sub-orbicularis, basi profunde cordata, lobis basalibus imbricatis, apice obtusato, nervis I et II et saepe III hirsuto-pubescentibus. Ochrea coriacea, hirsuto-pubescentis, 0.8-1.2 cm alta, bilobata, lobis oppositis. Inflorescentia racemosa terminalis, erecta, 15-20 cm longa, folium base inflorescentiae diminutum. Flores virescentes, 2.5 mm longi, pedunculo florali 3 mm longo; sepala 5 pilosa; stamina inclusa 8, 1 mm longa, calyci unita, filamentis subulatis connatis basi dilatatis, anthera triangularis 0.2 mm alta, styli 3, 1.5 mm longi. Fructus baccifer, 10 mm diam, semine brunneolo.

Habitat in locis litoralibus, prope silvam palustrem Rhizophorae.

A *C. rugosa* Desf., St. Thomas Porto-Ricoque species, inflorescentiae axibus (2 mm diam et non 5 mm) et foliis non impresissimis (multo plus in *C. rugosa* quam in *C. pubescenti*) differt. *C. rugosa* in Sancti Petri horto culta fuit (leg. Plee).

Howard (1949) et Tomlinson (1974) in Florida casus dioecios in *C. uvifera* cum staminibus sterilibus inclusis describunt. In Martinica femineos masculosque flores in eadem inflorescentia vidimus, sed staminibus sterilibus inclusis flores nunquam invenimus, stamina omnia exserta erant. Sed in *C. caravellae* stamina omnia fertilia steriliaque spectata inclusa erant.

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**PSACALIUM PEREZII (ASTERACEAE: SENECTIONEAE), A NEW SPECIES
FROM JALISCO, MÉXICO**

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ABSTRACT

A new species, *Psacalium perezii* from Jalisco, México, is described and illustrated. It is related to *P. peltatum* but differs in having heads arranged in raceme like, bractless, corymbs, densely glandular pubescent involucre bracts and corolla lobes united for 2/3 of their length.

KEY WORDS: *Psacalium*, Senecioneae, Asteraceae, México.

Identification of collections in preparation of a treatment of the Asteraceae for México has revealed the following novelty:

***Psacalium perezii* B. Turner, spec. nov.**, Figure 1. TYPE: MÉXICO. Jalisco: Mpio. Tecalitlan, "50.7 km al SSE de Cd. Guzman, carr. a Llanitos y brecha a Plan de Lego, y 3 km al S de P. de Lego, bosque de pino y encino, degradado, suelo prof., café oscuro," 1910 m. 4 Aug 1988, *M. Fuentes O. 486* (HOLOTYPE: TEX!, Isotypes: CHAPA).

P. peltato (H.B.K.) Cass. var. *peltato* similis sed capitulis in corymbis ebracteatis racemoideis dispositis, bracteis involucre libus dense glandulosi-pubescentibus, et limbo corollarum per ca 2/3 longitudinis unito differt.

Erect perennial subscapose herbs to 1 m high, the stems single and arising from a fascicle of seemingly fleshy roots. Basal leaves single and centrally peltate, the petioles ca 27 cm long, the blades round in outline, ca 24 cm across, deeply divided into 10 lanceolate divisions, the latter 9-12 cm long, 2.5-4.5 cm wide, coarsely and irregularly dentate, green above, glaucous below, sparsely puberulent or glabrate, except along the major nerves; cauline leaf single, much reduced and resembling the basal leaf except the petiole ca 8 cm long and the 5 lobes ca 3 cm long. Heads 11, eradiate, arranged in an open raceme, except for the terminal head, these somewhat conspicuously nodding, the ultimate peduncles 2.5-6.0 cm long (including the 1 to several minute bractlets).

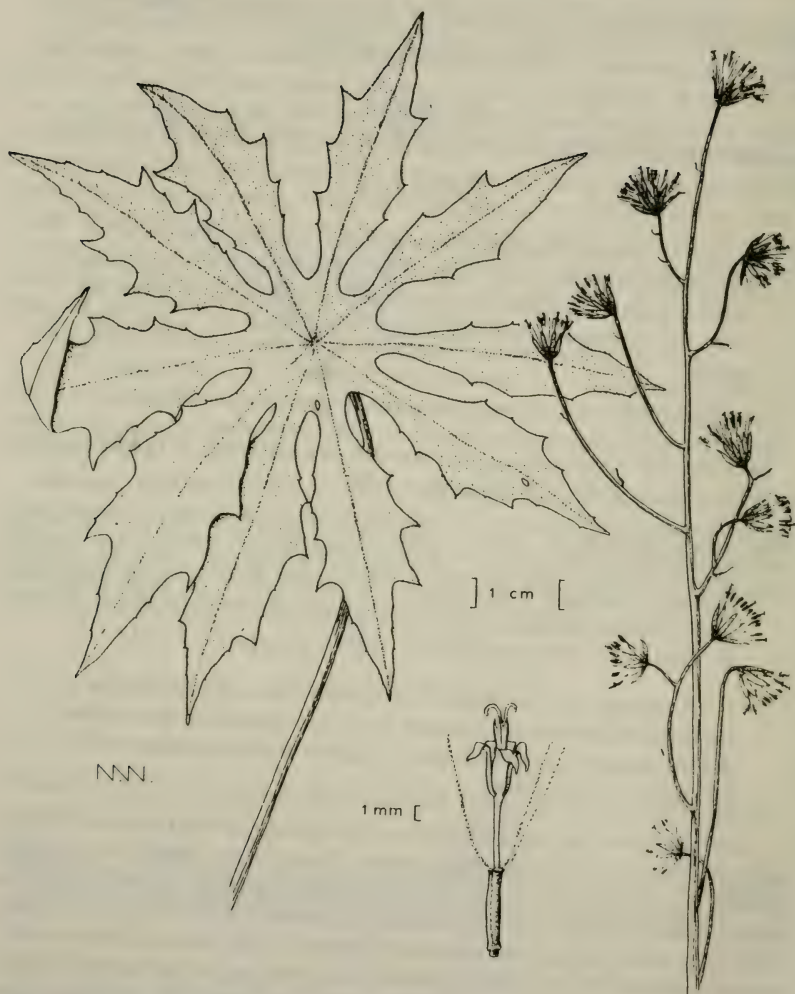


Fig.1. *Psacalium perezii*, from holotype

Involucres campanulate, minutely glandular pubescent, 8-10 mm high, the bracts ca 13 in 2 subequal series, the outer series more or less keeled below, the inner series less so, but with prominent scarious margins. Ray florets absent. Disk florets 20-25, the corollas said to be "verde y crema," but seemingly creamy white or yellowish, the corollas 8-9 mm long, glabrous, the tube ca 5 mm long, the limb sharply ampliate, ca 3 mm long, the throat ca 2 mm long. Anther sacs purplish, much exserted from the throat at maturity, the appendages acute, much reduced, ca 0.5 mm long. Achenes columnar, 5-6 mm long, glabrous, the pappus of numerous white bristles ca 10 mm long in 2-3 series.

The species seemingly relates to *Psacalium peltatum* var. *peltatum* but the capitulescence is an open, nearly ebracteate, raceme like corymb, the involucres and peduncles mostly densely short glandular throughout, without multiseptate trichomes, and the involucre bracts shorter, ca 13 in 2 series and the limb of the corolla merely lobed for ca 1/3 of its length.

In Pippen's (1968) treatment, which recognizes 3 varieties of *P. peltatum*, this species will key with difficulty to his var. *conzattii* (Robins. & Greenm.) Pippen, a taxon known only from Oaxaca and possibly Guerrero. The latter taxon, however, is markedly calyculate with longer involucre bracts (12-18 mm long), whilst *P. perezii* is ecalyculate with shorter involucre bracts (8-11 mm long). In McVaugh's (1984) treatment of *Psacalium* for his *Flora Novogaliciana*, the species will not key since the heads lack prominent subtending bracts, a key lead necessary to get to *P. peltatum*. In addition, the lobes of the corolla are united for 2/3 of their length, whereas those of *P. peltatum* are united only at the base, ca 1/6 of their length. And, of course, the raceme like corymbs of *P. perezii* are markedly different from the rather congested corymbose panicles found in *P. peltatum* var. *peltatum*, the only taxon which McVaugh recognized for his flora.

As noted by McVaugh (1984), *Psacalium peltatum* "is a variable and complex species" but the present collection, albeit related to that taxon, seems sufficiently distinct for specific recognition.

The species is named for José García Pérez, long time assistant at CHAPA. He is a student of the Asteraceae, having contributed a fine treatment of *Senecio* for the *Flora of the Valley of México*.

ACKNOWLEDGMENTS

I am grateful to T. Barkley for his helpful suggestions and to Guy Nesom for the Latin diagnosis. Nancy Webber provided the illustration.

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BOOK REVIEWS

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Biology, 5th ed. Helena Curtis & N. Sue Barnes. Worth Publishers, Inc., 33 Irving Place, New York, NY 10003. 1989, 1192 pp., 22 pp. glossary, 7 pp. appendix, 58 pp. index, \$47.95 cloth, ISBN 0-87901-394-x

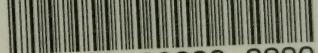
It is appropriate and refreshing that this text begins with a discussion of evolution and follows this introduction with a more extensive summary of evolution later in the book as the major theme to tie together the various topics treated in the text. This book will be useful for year long or three semester sequences of freshman biology and I anticipate that it will be widely adopted for such courses. It is accompanied by a complete set of supplementary materials, with a study guide by David J. Fox (\$9.95), instructor's manual, test files, transparencies and a lab manual. An additional feature (which I have not seen) is an interactive computer package to simulate and convey certain biological principles. This book should receive the extensive use that its predecessors have.

Japanese Plants, Know Them and Use Them. Betty W. Richards & Anne Kaneko. Shufunotomo Co., Ltd. Available in North America from Charles E. Tuttle Co., Inc., P.O. Box 410, Rutland, VT 05701-0410. 1989, 224 pp., illus., \$14.95 paper. ISBN 4-07-974660-1.

This book contains some excellent photographs of plants commonly used in Japanese gardens. The photographs are accompanied by descriptions of the plants. Descriptions discuss primarily foliage and flowers, not horticultural traits of the plants. Latin names of plants are found with each description, but the authorities are omitted. This would be a handy reference book for gardeners who might want to know something about the appearance of a certain plant they are considering planting in their gardens.

BOOKS RECEIVED

- A Manual of Alpine and Rock Garden Plants.** Christopher Grey-Wilson, ed. Timber Press, Portland, Oregon, 1989. x. 278 pp. \$29.95 (cloth).
- Himalayas.** Blanche C. Olschak, Augusto Gansser & Emil M. Bührer. Facts on File Publications, New York, NY, 1988. 288 pp. \$40.00 (cloth).
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- Land Above the Trees—A guide to American Alpine Tundra.** Ann H. Zwinger & Beatrice E. Willard. The University of Arizona Press, Tucson, AZ, 1989 printing of 1972 edition. xvii. 487 pp. \$16.95 (paper).
- Macroevolutionary Dynamics.** Species, Niches & Adaptive Peaks. Niles Eldredge. McGraw-Hill Publishing Co., New York, NY, 1989. xii. 226 pp. \$14.95 (paper); \$28.95 (cloth).
- Mosses Lichens & Ferns of Northwest America.** Dale H. Vitt, Janet E. Marsh & Robin B. Bovey. University of Washington Press, Seattle, WA, 1989. 296 pp. \$17.50 (paper).
- Native Shrubs and Woody Vines of the Southeast Landscaping Uses and Identification.** Leonard E. Foote & Samuel B. Jones, Jr. Timber Press, Portland, Oregon, 1989. 199 pp. \$32.95 (cloth).
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